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ON
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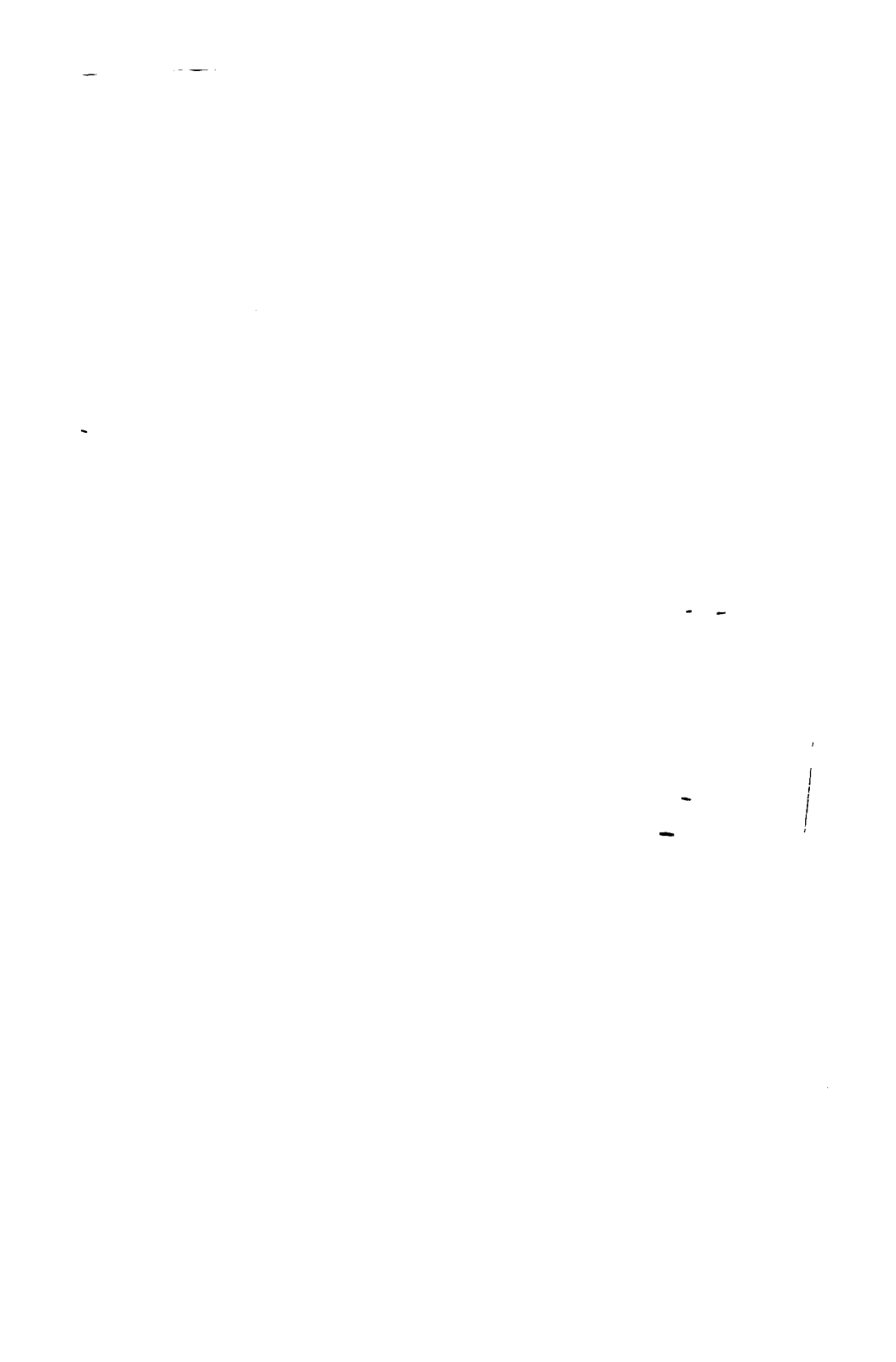
A N E S S A Y
ON
D I A B E T E S.

BY
H. BELL, D.M.P.,
ONE OF THE LIBRARIANS OF THE FACULTY OF MEDICINE OF PARIS.

TRANSLATED BY
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LONDON:
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HAMILTON AND CO., PATERNOSTER ROW.

MDC(CXLII).



TO
WILLIAM COULSON, ESQ.,

IN GRATEFUL REMEMBRANCE OF PAST KINDNESS,

AND

WITH A HIGH ESTEEM AND RESPECT FOR HIS SOCIAL

AND PROFESSIONAL CHARACTER,

THIS VOLUME IS INSCRIBED,

BY HIS ADMIRING FRIEND,

A. MARKWICK.

LONDON:
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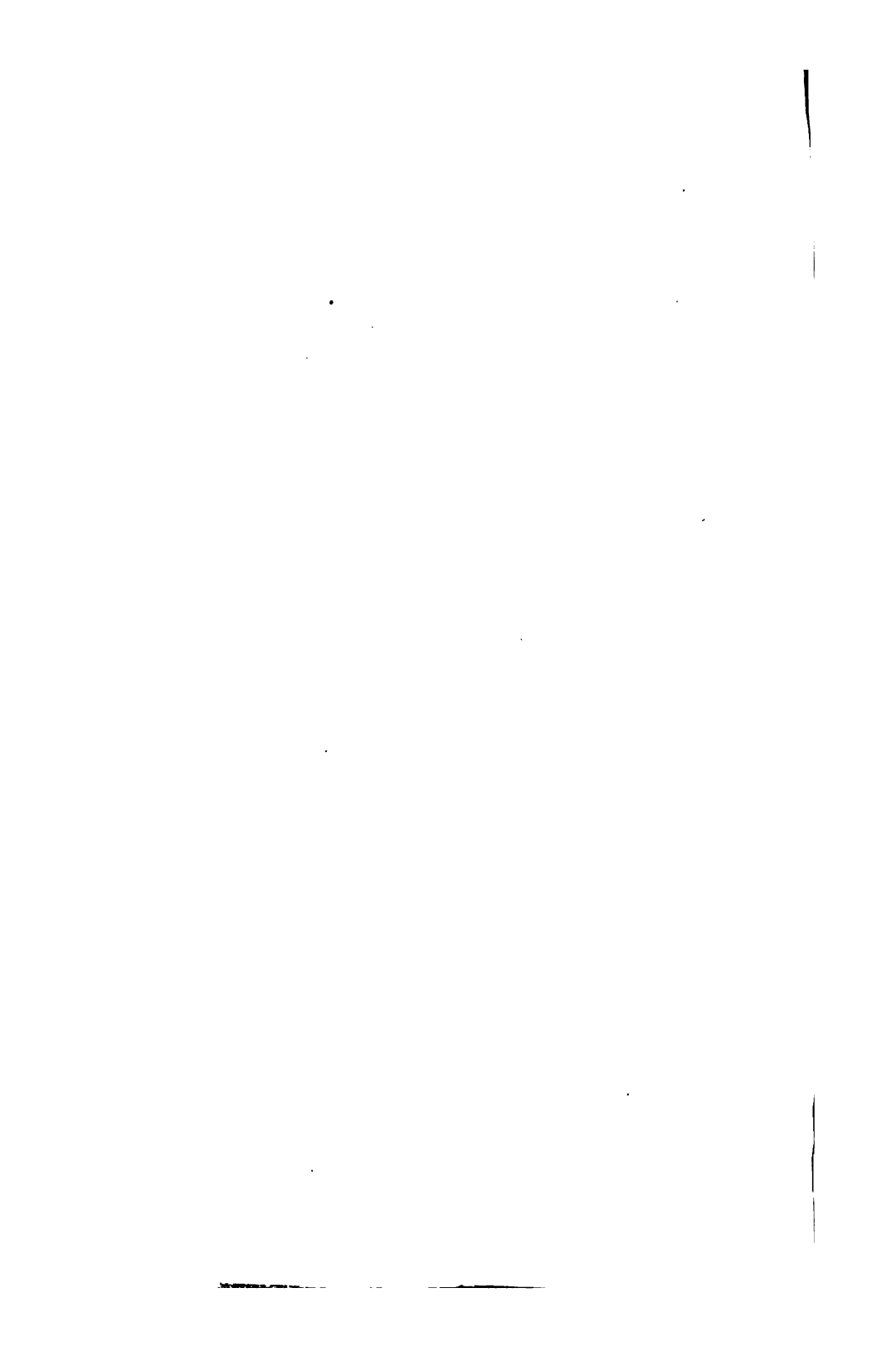
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P R E F A C E.

THE present Translation, when compared with the original in the *Dictionnaire des Etudes Médicales*, will be found to differ from it widely in many respects. It becomes me, therefore, to give, in this place, some little explanation.

The Author, on reviewing the article, after kindly granting my request to translate it, perceived many alterations and additions necessary to be made, modifications arising from the different manner of publication ; inasmuch as, for the Dictionary, he was obliged to be as concise as possible, and consequently could not give to many subjects their necessary development. In this *new edition*, for it may evidently be called so, the Author has been able to treat each species of Diabetes much more at large,



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not so, when we consider the difficulty ; for if, on the one hand, we show that saccharine matter may exist in urine, without any diabetic phenomena being observed ; and on the other, that the symptoms assigned to this affection may manifest themselves, and yet the urine contain no saccharine matter, shall we not have then sufficient reasons for deviating from the common opinion ?

Dr. Prout, one of those men who have done the most towards advancing the knowledge of the alterations of the urine, and who has been the most exact in its study, says, that a moderately sweet urine is not of rare occurrence in the different forms of dyspepsia, more especially in aged and gouty subjects. (*London Medical Gazette*, Vol. VIII. p. 385.) This is a positive assertion from an attentive observer ; one which merits our strict attention.

The modifications in the composition of the urine, designated by some writers under the names of Diabetes with excess of urea, Chylous Diabetes, Aqueous Diabetes, &c., are accompanied by a series of symptoms so alike to those attributed to Diabetes Mellitus, that, if we did not have recourse to chemical analysis, we should find it impossible to distinguish them. And this is the cause of the difficulty in choosing observations proper to institute the history of Diabetes ; for we are continually observing the exclusive partisans of Saccharine Diabetes found

themselves on facts which certainly do not belong to this form of the disease.

However, when we observe without prejudice, we cannot help recognising the very great analogy which exists between these different modifications of the urinary function, and the inconvenience that would arise in separating them one from another in a nosological plan. This is the reason why, in order to make these relations, still but very little known, more apparent, I have deviated from the custom generally followed, in France at least, by admitting several forms of Diabetes, characterised by a particular state of the urine.

This manner of considering the subject renders Diabetes more difficult to define; for we are still too little acquainted with any of the other forms of the disease, except that which is characterised by the presence of saccharine matter, to be able to give a definition which may equally well apply to all, separating, however, certain affections, such as polydipsia and polyuria, which have been almost always confounded with this disease. The following definition appears to me (although still incomplete) to unite the principal characters of Diabetes:—"a disease characterised by an excretion of urine, generally excessive, and variously modified in its composition, by extreme thirst, voracious appetite, dryness of the skin, and progressive emaciation."

Authors have admitted various kinds of Diabetes.

Sauvages recognised seven, five of which, at least, have no connexion with this disease. The division the most generally adopted at the present time, is that into *Diabetes Mellitus* and *Diabetes Insipidus*. This division, although apparently sufficiently founded, is completely inaccurate, because urine is never insipid, and may contain a great quantity of sugar, though devoid of a sweet taste. It appears to me more natural to distinguish the different forms of Diabetes by the characters of the urine. We will admit the following species: *Diabetes Mellitus*, *Diabetes with fatty matter*, *Ureous Diabetes*, and *Aqueous Diabetes*. We will successively relate their history, giving to each very unequal developments, on account of the very few documents we possess relative to some of them.

HISTORY.

Doubts may be entertained if Hippocrates observed Diabetes; at least, the passages in his works which have been quoted as applying to this disease, seem more to relate to critical urinary discharges.* Mention is made there of the excretion of urine being more abundant than the quantity of fluids ingested; but evidently, the author only spoke of those

* Hippocrates de Morbis Popularibus, Lib. III. Sec. III. Edit. Kühn, Vol. III. p. 488.

critical evacuations which, in his opinion, terminate diseases. With better reason, perhaps, we might apply to this malady a phrase from the Book of Predictions, in which it is stated that, "If the urine is aqueous, and more abundant than the fluid taken, it is a sign that the food is not properly assimilated, during the whole time this superabundance of urine persists."* But these words are so vague, that to perceive in them a positive relation to Diabetes, there must really exist a great desire to do so.

Cœlius Aurelianus tells us that Apollonius of Memphis, disciple of Erasistratus, and Demetrius of Apamea, disciple of Herophylus, were acquainted with Diabetes. But the two short phrases devoted to this subject by the Latin physician, inform us only of the opinion of these two authors on the pathology of Diabetes, which, in their ideas, is only a rapid evacuation by urine of the liquid ingested. (*Cœlius Aurelianus Chronic. Lib. III. Cap. 8, et Lib. V. Cap. 5.*)

Celsus,† Galen,‡ Alexander Trallianus,§ Aræteus,|| Ætius,¶ Paulus Ægineta,** have spoken of the disease in question. Aræteus, in his description of

* Hippocrates, ed. Kühn, Vol. I. p. 195.

† De Medicinâ, Lib. IV. Cap. XX. No. 2.

‡ De Locis Affectis, Lib. VI. Cap. III.

§ Lib. Medicin. Lib. IX. Cap. VIII.

|| De Causis et Signis Morborum, Lib. II. Cap. II.

¶ Tetrabibl. II. Sermon. I. Cap. I.

** Lib. II. Cap. IV. Lib. III. Cap. XLV.

it, unites all its most striking characters, except the saccharine state of the urine. His successors added nothing of any consequence to what he had said; they endeavoured principally to show, what Galen and Ætius had already made known, that in Diabetes all liquids passed by the urinary organs without undergoing any change. Mark Gatenaria* and Cardan† have transmitted to us the history of a young girl treated for and cured in 1481, at Milan, by Fr. of Bustis, of an affection which appears to relate to Diabetes, and which is the first example of this disease furnished us by the annals of the science. We must arrive at the middle of the seventeenth century to Th. Willis, before we meet with any thing really important on this disease. This illustrious physician, in a very good history of Diabetes, is the first to describe the sweet taste of diabetic urine. "Subjects," says he, "affected with this disease make more urine than they take of fluid; they have besides a continual thirst and a kind of slow hectic fever. It is not true, as some authors affirm, that what is taken as drink passes through the system without undergoing any alteration; for in all the patients whom I have seen, (and I think the same thing will be always observed,) not only did the urine differ from the liquids drank, and from all the other liquids of the body, but it had

* De Curis Ægritæad. p. 143. Basil. 1538.

† De Rerum Varietate, Lib. VIII. Cap. XLIV. p. 165.

besides a very remarkable sweet taste, as if it had been mixed with honey or sugar."* Sydenham, Willis's contemporary, has not mentioned the sweet taste of the urine as one of the characters of Diabetes, although he has given a very good description of this disease. Morton afterwards proved the justness of Willis's remark. But it was not until the end of the eighteenth century, when Dobson,† F. Home,‡ and especially Cruikshank,§ chemically demonstrated the presence of saccharine matter in diabetic urine.

Since then, this affection has been the subject of numerous works, some of which are of great importance. As we proceed, we shall have occasion to mention several of them.

DIABETES MELLITUS.

This is the most frequent form of Diabetes, the only one upon which we possess any satisfactory notions. If we have given it more developement than the other parts of our subject, our excuse will be, the present state of the science.

Symptoms.—Diabetes generally commences in a

* *Pharmaceutice Rationalis*, Sect. IV. Cap. 3, p. 164.

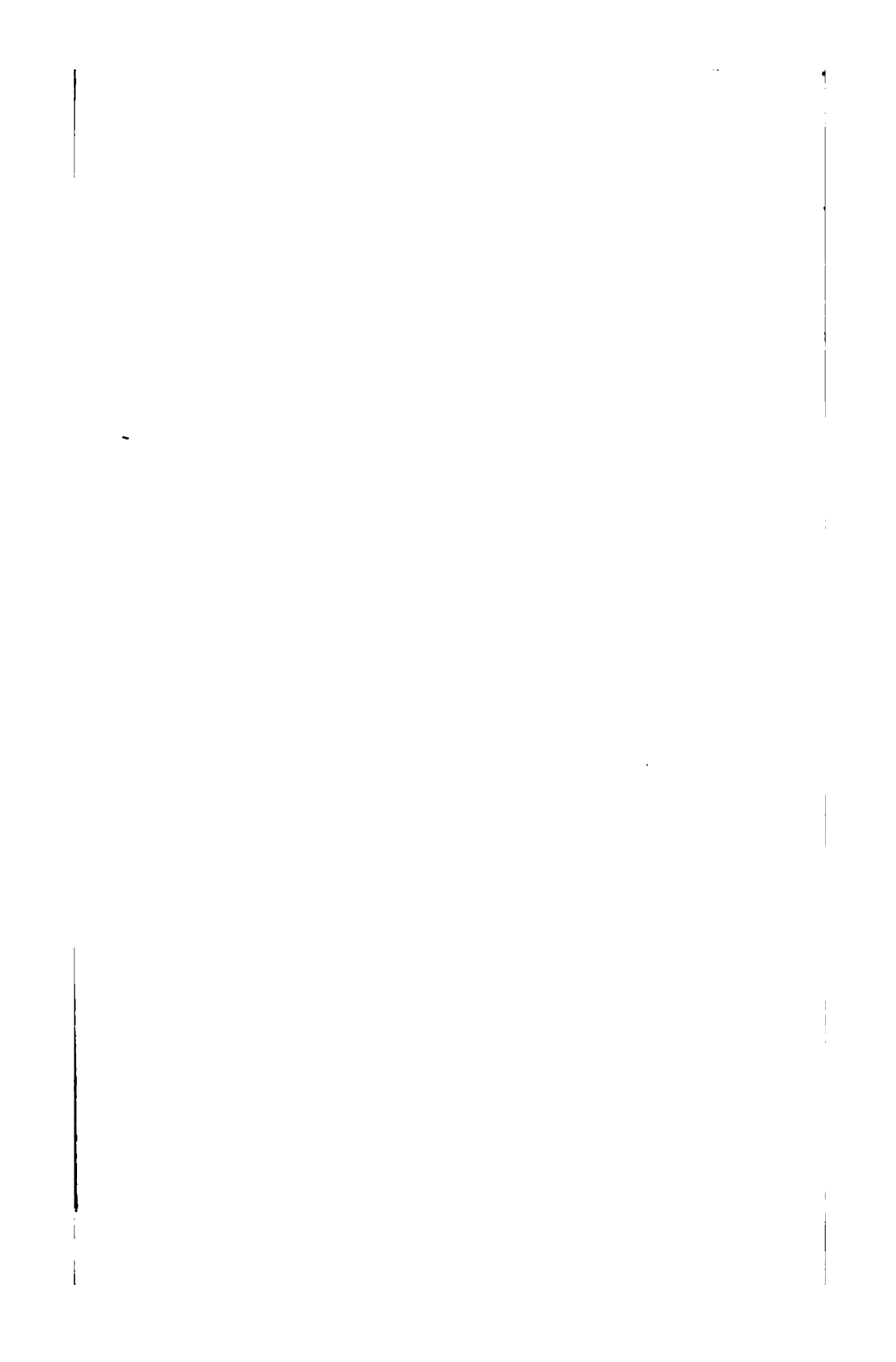
† *Medical Observations and Inquiries*, Vol. V. p. 298.

‡ *Clinical Experiments, Histories, and Dissections*, Edin. 1780, p. 296.

§ *Bollo on Diabetes Mellitus*, Lond. 1798.



AN ESSAY
ON
DIABETES.



A N E S S A Y
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the 6th is nearly equivalent to 1.044. We ought never to neglect to ascertain the specific gravity of the urine in Diabetes; it is the only quick and easy method of assuring ourselves of the real state of the patient; and it is on account of its not having been mentioned, that the greater part of the numerous observations on the cure of this affection, published in the medical journals, are totally without value, as we shall see further on. The specific gravity of the urine in Diabetes Mellitus varies, in general, between 1.030 and 1.060; but it may be less or greater. Dr. Prout says he has seen saccharine urine of specific gravity so low as 1.015; it is not unusual to find it as high as 1.070 or 1.075. It is always in a direct ratio with the quantity of saccharine matter it contains. Dr. Henry made some careful experiments to ascertain what quantity of residue, urine of a given specific gravity, contained; he found that a pint of diabetic urine of specific gravity 1.020 evaporated to dryness, gave 382.4 grains of residue, and that for every degree the specific gravity of the urine increased as far as 1.050, the residue augmented by 19.2 grains, so that at 1.021 it was $382.4 + 19.2$, or 401.6 grains, and at 1.050, 958.4 grains, or 1 oz. 7 dr. 6 scr. 18 grains. It is to be regretted, that the author of these experiments should have been content to establish the relation existing between the specific gravity of the urine and the quantity of extractive matter furnished by evaporation. This extractive

matter may be composed of very different substances, as salts, sugar, albumen, &c. It was of much greater importance to establish the relative quantity of pure sugar contained in the urine. This is a subject which well deserves the attention of skilful chemists.

The saccharine matter of diabetic urine is identical with that of starch, and, like this, has the property to combine with common salt (chlorure of sodium). It is generally sapid, its taste is of a sweet nature like honey, and this is generally sufficient to recognise it; but this method may sometimes lead us into error, as diabetic urine is at times completely devoid of a sweet taste, although it may possess all its other qualities indicating the presence of sugar. In this state, if we boil it with a tenth part of sulphuric acid, it becomes perfectly sapid. This particularity of the presence of an insipid sugar in diabetic urine had been mentioned by Thenard and Dupuytren.* M. Thenard described it as a particular kind of sugar. In a much more recent work, M. Bouchardat, having studied with great care the properties of this sugar, found that its composition is exactly the same as that of sugar of grapes.† Since then, this skilful chemist has continued his researches, and has discovered that the insipid sugar is merely a mixture of diabetic sapid sugar with the other elements

* *Annales de Chimie*, Tome LIX.

† *Revue Médicale*, June, 1839, pp. 327, 337, 338.

of urine, such as lactate of urea, lactate of soda, chlorure of sodium, and extractive matter.* The quantity of saccharine matter which this kind of urine contains, varies considerably. M. Bouchardat has met with some containing only an eightieth part, while in others he found at least a seventh of their weight. (Loc. Cit. p. 173.) Vauquelin and Segalas have extracted from a diabetic urine a seventh of its weight of saccharine matter.† In an analysis made by M. Peligot, the saccharine matter was in the proportion of a tenth.‡

The most convenient means of ascertaining the presence of saccharine matter in diabetic urine, is to add to it some yeast, which gives rise to vinous fermentation, a most delicate test, as it can detect one part of it in a thousand parts of urine.§ Every cubic inch of gas given off nearly corresponds in round numbers with one grain of sugar—47 of gas to 45 of sugar. This process, although simple of execution, yet requires certain precautions, in order to avoid an erroneous result, as sometimes the yeast contains a small quantity of saccharine matter, which is decomposed during the fermentation, and might make one suppose that sugar existed in the urine, although in reality it was free from it. But the quantity

* Bouchardat, *Annuaire de Thérapeutique, de Matière Médicale, et de Pharmacie*, Paris, 1841, p. 179.

† *Journal de Physiologie*, Tome IV. p. 354.

‡ *Annales de Chimie et de Physique*, Tome LXVII. p. 140. 1838.

§ Christison, *Lib. Pract. Med.* Vol. IV. p. 249.

of carbonic acid gas given off in this case is always very small. On the other hand, if the temperature to which the liquid is exposed be too high or too low, fermentation may then not take place, although the proportion of saccharine matter may be sufficiently great. M. Bouchardat even asserts, that in a great number of cases, a large quantity of the sugar escapes the transformation in order to be converted into lactic acid. (*Loc. Cit.* p. 175.) With a little attention and a certain degree of skill, these inconveniences may be easily prevented, and fermentation nevertheless be considered one of the most simple and valuable tests of the existence of saccharine matter in the urine, more especially if we do not rest satisfied with merely obtaining carbonic acid, and necessitate the presence of alcohol; for recent experiments have proved, that certain animal substances could, under the influence of fermentation, give rise to carbonic acid gas, without any alcohol being produced, this being the only true criterion of the presence of sugar.

Another process has lately been proposed for ascertaining the presence of saccharine matter in urine; it is by studying the optical phenomena of this liquid. We know that rock crystal has the property of turning the plane of polarization of a polarized beam of light which passes through its axis. M. Biot has discovered that several organic substances, as, for instance, the different kinds of sugar, gum, the

soluble matter of fecula, sugar of milk, albumen, gelatine, produce this circular polarization, and that all sugars, as well as their aqueous solutions, produce the rotation to the right.

M. Biot imagined, that the instrument he has invented for studying the circular polarization in liquids,* might advantageously be applied, with a view of recognising the presence of saccharine matter in diabetic urine. He ascertained, that healthy urine gives no indication of any rotatory power; that solid diabetic sugar, either pure or in combination, does possess it, in the same sense and of the same intensity, as the common sugar of starch; and also that the urine of diabetic patients has a power of rotation directed towards the right hand of the observer, and that the energy of this deviation is in proportion to the quantity of saccharine matter contained in the urine.†

M. Guerard had already proposed this character in 1838, as an easy means of ascertaining the existence of saccharine matter in urine, without any chemical analysis. The instrument he employs is much more simple than that of M. Biot. It consists in filling, with the urine to be examined, a tube eight or ten centimetres in length, closed at both

* See the description of this instrument in the *Comptes-Rendus Hebdomadaires des Séances de l'Académie des Sciences*, for Sept. 7th, 1840.

† *Comptes-Rendus Hebdomadaires de l'Acad. des Sciences*, 28th December, 1840.

ends by a disk of glass. In looking through this tube, by means of a prism of calcareous spar, at the rays, reflected by a mirror blackened on the back, we observe two coloured images which pass through different shades, as the prism is gradually turned.*

These methods have the inconvenience of requiring certain conditions which would prevent them from ever becoming of general use. The urine to be examined must be very transparent; the observer must be accustomed to employ the instrument, and to make physical observations. Moreover, M. Biot's instrument is very expensive; so that, while we acknowledge in it an ingenious application of the physical sciences to Diagnosis, we think the preference will be given to the other more simple means, which are at our disposal.

There are several methods for ascertaining the quantity of sugar in urine: either by gathering the carbonic acid gas, which is disengaged during the fermentation, or by merely passing the gas through a solution of subacetate of lead, which is thus precipitated as carbonate of lead; or, in adding to the urine a solution of subacetate of lead, afterwards filtering the liquor, and passing through it a current of sulphuretted hydrogen gas, again filtering, and afterwards evaporating to a syrupy consistence. These means are rather complicated; the following,

* *Repertoire général des Sciences Médicales*, Tome XVIII. p. 219, art. LUMIERE.

although less exact, suffices in practice. The urine is to be evaporated to dryness, the residue is then treated with alcohol, which dissolves the sugar and all the extractiform substances, soluble in this medium. By evaporating slowly this solution, the sugar crystallizes in small grain like crystals, similar to the sugar of grapes; sometimes, however, an uncrystallizable syrup is obtained, which appears to be owing to the temperature being too elevated during the operation.

It has been imagined for a long time, that diabetic urine contained no urea. Cruikshank, Dalton, Fourcroy, Nicolas and Gueudeville, Thenard, &c., held out this opinion. Bostock, in his *Memoir on Diabetes*, published in the sixth volume of the "*Memoirs of the London Medical Society*," mentioned having obtained crystals of nitrate of urea, from an extract of diabetic urine; but in repeating his experiments on urine sent to him by Dr. S. A. Bardaley, he did not obtain the same results, and concluded that he had been mistaken.* Drs. Henry and Prout maintained, however, that diabetic urine always contains urea, but in less quantities than that in its normal state. M. Barruel has also found a certain quantity of urea in it. Dr. Kane has since proved that urea exists in diabetic urine, in the same proportion as in healthy urine.† Mr. Mac Gregor,

* S. A. Bardaley's Hospital Reports, p. 179.

† Dublin Journal of Medical Science, Vol. I. No. 1.

considering the fact pointed out by Dr. Henry, that the saccharine matter prevented the action of nitric acid on the urea, even in normal urine, has imagined to destroy the same by fermentation. By this means, which, however, had been employed for the same purpose, by M. Lafongouzi, of Toulouse,* he arrived at the following results: that in Diabetes Mellitus, the urine contains urea, but in less proportion than in the normal condition, considering the excessive quantity of water contained in diabetic urine; but that in reality, patients affected with this malady excrete in 24 hours a much greater quantity of urea, than a person in health does in the same space of time. Dr. Christison has also found that urea might always be detected in diabetic urine. M. Bouchardat,† who does not attach any very great importance to Mac Gregor's experiments, because he maintains; that the fermentation partly destroys the urea, as well as the saccharine matter, has been able to ascertain more accurately that diabetic urine contains the same quantity of urea as that of healthy persons.†

It is very difficult to be able to fix with any exactitude the quantity of urea contained in diabetic urine. During the manipulations necessary to dis-

* *Annales de la Société de Médecine Pratique de Montpellier*, 2me série, 1819, Tome VI. p. 191,—*Récherches et Observations sur le Diabète*.

† *Loc. Cit.*

cover it, a part of it becomes transformed, probably, into carbonate of ammonia. However, we may mention, that generally speaking, in subjects affected with Diabetes, as well as in those in perfect health, the quantity of urea is proportionate to the quantity of nitrogen contained in the food they take.

It was thought, that the sugar in diabetic urine had taken the place of the urea, and the extreme analogy in the composition of these two substances, pointed out by Prout, seemed to favour this opinion. Chemical analysis, as we have seen, disproves this altogether, and shows that the quantity of urea is totally independent of that of the sugar, and that an excess of the one does not necessarily cause a diminution in the other.

Some authors have recently asserted, that the chemical character of diabetic urine, was the absence of uric (lithic) acid. This assertion is also inexact. In several patients affected with Diabetes admitted under M. Rayer at the Hôpital de la Charité, small grains of lithic acid were seen, with the naked eye, at the bottom of the vessel, in which the urine was contained, and a large quantity of crystals of the same acid were recognised by the microscope in the liquid. M. Rayer has had, several times, occasion to see the same thing in other patients affected with this disease, and has even met with lithic gravel in a gouty and diabetic patient. M. Bouchardat has met with a similar case. (Loc. Cit. p. 181.) M. Mialhe, in

the case published by M. Fournet,* recognised the presence of lithic acid, but in small quantities.

Many authors have said, that diabetic urine, when left to itself, underwent, at the expiration of a day or two, vinous fermentation. This is true, but it was difficult to account for it. Prout has stated, that he found in this kind of urine a liquid, white like milk, perfectly resembling chyle, which deposited itself at the bottom of the vessel. In these cases, fermentation proceeded rapidly, the chylous matter acting, to all appearance, like a ferment. M. Quevenne, ignorant of this passage in Prout's work, in examining a sediment found in the urine of a diabetic patient, ascertained the presence of a ferment, identical with, or at least possessing the greatest resemblance to yeast. It presents itself under the form of a white, rather greyish stratum, unctuous to the touch, and which, when examined by the microscope, appears to be formed of a multitude of small regular globules, generally perfectly round, or rather oval, transparent, apparently limited by a black circle, having at their centre a small, but scarcely visible, ring, the diameter of which varies between $\frac{1}{100}$ and $\frac{1}{50}$ of a millimetre; insoluble either in ammonia or ether, and which, when added to sugared water, produce very quickly the vinous fermentation; this substance does not exist in diabetic urine the moment it is excreted, but

* Archives générales de Médecine, 2me série, Tome VII. p. 257.

is formed after a certain time, probably by the transformation of the albumen, or some other animal matter.*

These are the principal elements of the urine in Diabetes Mellitus; but there is one circumstance which we must not lose sight of, viz., the frequent variation in the composition of the urine, at different times in the day, and the marked influence the food has upon it. Consequently, it is necessary to save every evacuation of urine in the 24 hours.

Other substances are to be found, which may be considered merely as accessory. It is not uncommon to meet with albumen. Some authors, and we may mention Dupuytren and Thenard, have even thought that its presence announced convalescence, an opinion very far from being borne out by facts. Prout is much nearer the truth when he says, that the most severe form of Diabetes is that in which there is albuminous urine. At times, the saccharine matter becomes mixed either with blood, pus, or mucus. There may also exist, at the same time, stones in the bladder, a remarkable example of which has been mentioned by M. Pleindoux.†

* Quevenne, *Examen du Ferment de l'Urine Diabétique*. L'Expérience, Tome I. p. 405.

† *Annales Cliniques de Montpellier*, 2me série, Tome IX. p. 61.

ON THE STATE OF THE BLOOD IN DIABETES MELLITUS.

When the presence of saccharine matter in diabetic urine had been proved, attempts were made to find it in the blood. This research has been undertaken by a great number of very experienced chemists. Wollaston, Nicolas and Gueudeville, Vauquelin, MM. Henry the younger and Soubeiran, Kane, &c., have not been able to find any trace of it, and it is now generally believed, that it contains none. Dobson, however, asserts having found it. Rollo remarked that the serum of the blood of diabetic patients, when treated with nitric acid, gave a larger quantity of oxalic acid, than was furnished by the serum of the blood from healthy individuals. M. Ambrosiani* announced in 1836, that he had obtained, from a pound of diabetic blood, one ounce of sweet syrup. Mr. Maitland,† almost at the same period, also found in the serum of the blood taken from a person afflicted with the same disease, some saccharine matter. In 1837, Mac Gregor confirmed the reality of this discovery, and was enabled to show its presence in the serum, by causing it to ferment, by the addition of yeast. More recently, Dr. Rees has arrived at the same result, though by different

* Journal de Chimie Médicale, 2me série, Tome II.

† London Medical Gazette, 1836.

means;* and M. Bouchardat† has proved the same thing. The presence of saccharine matter in the blood of diabetic persons is now, therefore, an incontestable fact; but it remains to be known, whether it always exists, and whether its quantity is proportionate to that contained in urine. Dr. Christison has related a few cases, which rather tend to establish, that saccharine matter is not always present, and that its quantity, when it does exist, is not in proportion to the intensity of the disease.‡ But these are questions which require further examination. It would be in our researches after the saccharine matter in the serum of the blood, that we should find the optical characters of so much avail. Unfortunately, this method of investigation is but little applicable in this case. The serum of the blood is rarely sufficiently transparent to allow the luminous rays to pass through it, whilst the small quantity of sugar which might exist necessitates the employment of a tolerably long column of liquid. This is an obstacle which I have met with in my inquiries on this subject, and I have not been able to overcome it. M. Biot was not more successful with the serum of diabetic patients which had been sent him by M. Rayer.

The other properties of the blood from diabetic

* Guy's Hospital Reports, No. 7, October, 1838.

† *Revue Médicale*, June, 1839.

‡ *Library of Medicine*, Vol. IV. page 252.

patients, have been badly investigated. Sometimes the blood is cupped, and has a milky appearance, owing to the presence of a small quantity of fatty matter. Prout found that the mean density of the serum was 1.029.5, which is rather greater than the mean of normal serum; and that the albumen and salts were in proper proportions. Nicolas and Gueudeville, MM. Soubeiran and Henry, have observed that diabetic blood furnishes more serum, less coagulum, and less fibrine, than that from healthy subjects, a result which has been confirmed by M. Bouchardat's experiments. (Loc. Cit. pp. 191, 192.)

Mr. Mac Gregor found saccharine matter in the saliva and gastric juice of diabetic patients; he has even proved its existence in the fœces, on the surface of which it crystallizes, but could find no trace of it in the liquid transpired by these individuals. After having obtained this liquid, by means of sponge, he added some ferment, but could not produce fermentation in it. P. Frank, however, has distinguished the sweet taste of the perspirations in Diabetes Mellitus.

Coindet mentions an alteration in the air expired by diabetic persons, which consists in its containing less nitrogen than that of healthy subjects. Mr. Mac Gregor's recent researches do not support this observation. He found in it no change whatever.*

* Reports of the British Association for the Advancement of Science, for the Session 1840.

The *progress* of Diabetes is far from being the same ; it is generally slow and *progressive*, and the disease sometimes requires several years to go through all its stages ; at other times, its progress is very rapid. Dobson* observed a case, in which the disease terminated fatally in five weeks from its commencement. Oosterdyck even relates having treated a case, in which the patient sank in a few days only from the period of attack ;† but this observation, which we find mentioned every where, is of but little value, on account of the uncertainty of the diagnosis, and the absence of almost all the necessary details. Whenever the disease has not made very great progress, it is generally of long duration ; but should severe complications arise, it then proceeds to a rapid and fatal termination.

Diabetes is always a continued disease ; some authors, it is true, Borichius,‡ Camerarius, Bartholin, Mead, Casimir Medicus,§ &c., have mentioned cases of Diabetes returning periodically every three days, every month, every six weeks, &c. ; but these facts do not merit a great degree of confidence, as it is very probable, that the authors have been deceived by the exacerbations of the disease, and have taken simple remissions for complete intermissions.

* Medical Observations and Inquiries, Vol. VI. No. 27.

† Mémoire de la Société de Harlem, Tome XII. p. 30.¹

‡ Miscellanea Natur. Curios., Dec. 1. Ann. 2. Observat. 167.

§ Traité des Maladies Périodiques sans Fièvre, 1790.

Complications. It is very uncommon for Diabetes to go through all its stages without becoming complicated with some other affection: this is a remark made by almost every observer. The most frequent of all diseases with which Diabetes becomes united, is consumption; and this occurs so often, that some authors, as Copland, Bardsley, Willan, and others, say they have never witnessed a case of Diabetes, without some pulmonary affection existing. Sometimes consumption exists previous to Diabetes: in such cases, the progress of the tuberculous affection seems suspended for a more or less lengthened period; but, so soon as means are employed to relieve the diabetic disease, the consumptive symptoms are seen to return with increased activity, rapidly terminating in death. Another rather frequent complication of Diabetes, is the granular affection of the kidneys. Dr. Christison has clearly pointed out this species of complication. Twice, on post mortem examinations, he found the kidneys granulated in a very marked degree. The urine, during life, was albuminous.

In a very recent case, which I have had occasion to observe, in Mr. Rayer's service at the Hôpital de la Charité, the patient had voided, for some few days, albuminous urine, and had a rather considerable anasarca of both the inferior extremities. A simple nephritis with infiltration of pus, was observed on examination after death, but without any trace of

granulations, or any of the characters of Bright's disease.

Diabetes is very frequently complicated with dropsy, especially anasarca; this is in general observed towards the termination of the malady, when the sufferers are greatly debilitated. The serous effusion may appear and disappear several times, but, at last, it becomes a constant, and very severe symptom of the primitive affection. Generally speaking, dropsy is brought on by a granular lesion of the kidneys, as I have before mentioned. However, we can easily imagine a more or less considerable anasarca being occasioned by a state of great debility, and genuine cachexia, which is the result of an advanced state of Diabetes.

This disease may be complicated with many other affections, but those which I have just mentioned are of by far the most frequent occurrence. Sometimes it is attended with a scrofulous affection, at others, with a chronic rheumatism; whilst at others there may be general gouty symptoms, and even the long list of acute diseases may develop themselves, during the course of Diabetes, as inflammations of the urinary passages, of the pleura, of the lungs, of the digestive canal, &c.; complications which ought to be considered merely as accidental, or at least, in no other way allied to the diabetic condition, than as the effect of a marked predisposition.

Diagnosis.—In the majority of cases, the diag-

nosis of Diabetes offers no difficulty. The excessive abundance of the urine, its taste, its specific gravity and pale greenish colour, the ravenous thirst, the keen appetite, with progressive emaciation, the dry skin—are characters which can leave no doubt as to the existence of the affection. In some cases, the aspect alone even suffices to enable us to give great presumptions as to its existence. Among the lower classes of people, who are generally but little attentive to cleanliness, stains of crystallized sugar form on the woollen clothes, a phenomenon which gives an immediate insight into the nature of the disease. Dr. S. A. Bardsley has already mentioned, that diabetic urine stains the linen and stiffens it, as if starch or mucilage had been applied, and that in proportion as the urine contains less saccharine and extractive matter, it loses both these properties. (Loc. Cit. p. 133.) The diseases which could be the most easily mistaken for Diabetes, are Polydipsia and Polyuria; but numerous and well-marked phenomena exist, which enable us, at all times, to distinguish these affections.

In Polyuria, the symptoms of emaciation and wasting are entirely wanting; the urine possesses its natural composition, as well as its normal, physical, and chemical character. A very little attention, therefore, is sufficient to enable us to establish a distinction between them.

Neither does Polydipsia present any very great

difficulty to prevent it from being distinguished from Diabetes Mellitus. In this affection, the urine is nearly colourless, and has the appearance of water, and its specific gravity is but little superior to that of this fluid when pure ; it varies between 1.000 and 1.007. Its action on litmus paper is scarcely sensible ; the patients' general health is usually good, and we remark that their embonpoint, although not very evident, remains stationary, and that the emaciation does not progress as in Diabetes. The characters will always suffice us to establish a diagnosis. However, I cannot do better than refer the reader, for further details, to the very interesting thesis by M. L. M. Lacombe, on Polydipsia, held before the Faculty of Medicine of Paris, in 1841.

In some rare instances, however, it is a task of some difficulty to recognise Diabetes Mellitus ; this happens, especially when the quantity of urine is not very considerable, or when the patients have not perceived that they drink or pass their urine more frequently than usual.

One of the most remarkable examples of an error of this kind, is mentioned by Dr. Kennedy in the fourth volume of the *Transactions of the Medical Society of Calcutta* ; it relates to a man about forty years of age, who, from having become extremely sedentary, after a very active life, felt a general weakness, became very thin, dejected and sad, phenomena entirely in opposition to his natural cha-

racter ; he was supposed to be hypochondriacal, and attention was chiefly paid to his moral discipline. At the end of three years, his condition had become sensibly worse, without any new system presenting itself. Dr. Kennedy did not at first recognise the affection, and it was not without a great deal of difficulty that he learnt that the patient was obliged to rise four and five times during the night, to make water, but as he did not receive his urine into a vessel, he could not say, whether it was in larger quantity than usual. When once the possibility of the existence of the disease was established, it was easy to verify the presence of all the symptoms common to it ; however, the disease had existed several years, without its having been once suspected. Dr. Latham has published a still more curious case, of what might be termed Latent Diabetes Mellitus. The examination of the urine was the only thing by which the disease, already in a very advanced stage, could be recognised.

We ought to be aware of similar errors, in order, if possible, to guard against them ; but unfortunately, it often occurs, that, from a superficial examination, Diabetes escapes the notice of the physician. I have seen lately a very attentive and clever physician, mistake a far advanced case of Diabetes Mellitus for Chronic Rheumatism.

Pathological anatomy has thrown, as yet, very

little light on the Pathology of Diabetes ; its results have been entirely negative.

The kidneys have been, in general, found to be enlarged, of a more or less deep red colour, engorged with blood, sometimes, on the contrary, remarkably pale, at times flaccid, at others generally or partially indurated. This kind of alteration is by far the most frequent. In all the cases of post mortem examination which I have had an opportunity of witnessing, the increased size and sanguinary congestion of the kidneys were remarkable. The average weight of each kidney was rather more than six ounces.* M. Rayer has told me, that he has constantly observed these alterations. Some authors have asserted that the vessels of the kidneys were sometimes extremely dilated, distended, and easy to tear. This assertion is at least hazardous, as the observers have given no proofs of its exactitude. Brodie, it is true, having to examine the kidneys of one of Dr. Warren's patients who had died of Diabetes, injected one of them, and observed that the cortical substance was redder, and that the *tubuli uriniferi* were larger, more numerous, and more distinct than in the normal state ; but Dupuytren, on injecting the kidneys of diabetic persons, found that, although voluminous and flabby, they did not permit the injection to pass through them more

* Perhaps about six ounces English.

easily than those in their natural state. On the other hand, there are numerous cases of Diabetes, in which the kidneys presented no alteration. P. Frank and Muller have seen them much smaller than usual. Beer has found them filled, and enormously distended by hydatids; (probably this was a case of distension of the calyces and pelvis, with atrophy of the substance of the kidneys.) Hecker speaks of a cartilaginous induration of their envelope and cortical substance. Muller, Duncan, and Copland, say they have seen the renal nerves decidedly increased in volume. If we add to this the various lesions of the pelvis, of the ureters, of the bladder and urethra, a simple or tuberculous distension of the mesenteric glands, with distension and softening of the lymphatic glands of the whole body (Rutherford and Monro); dilatations of the thoracic duct; a tuberculous state of the lungs in all its stages; inflammation of these organs, of the pleura and pericardium; aneurismal dilatation of the pulmonary artery (Luroth, Lobstein); partial or general congestion or inflammation of the stomach and intestines; hypertrophy, with congestion of the liver and spleen; we shall have nearly all the alterations mentioned by authors, many of whom have noticed the state of the blood. Michaelis, Conradi, and Hecker, have found in the large vessels and cavities of the heart, chyle imperfectly mixed with the blood; they have also remarked, as well as Marshall,

that the blood was of a chocolate colour. Rutherford asserts, that, in every case he had seen, the blood was black and fluid. What are we to conclude from all this? Nothing. Not one of the lesions mentioned is constant; in fact, we know of no morbid alteration in Diabetes. It is better to acknowledge it, and leave it for further researches to throw light on this obscure subject.

Prognosis. The opinion as to the probable termination of the disease must be always unfavourable; this is, I am aware, quite in opposition to what is said every day. Numerous cases of cure of Diabetes are recorded in the medical periodicals; but if we examine them attentively, we soon perceive that they do not possess that value which has been attributed to them. In some of them, there is no proof of its having existed at all; in others, the necessary details for any opinion to be formed as to the state of the patient after his cure, are entirely wanting. Neither the specific gravity nor the composition of the urine are specified; consequently, without these statements, it is impossible to be assured of the reality of the recovery. It is, in general, easy to reduce the quantity of urine nearly to what it is in health, to diminish the hunger and thirst within certain limits, and to do away with the moral dejection and physical weakness; the sweet taste in the urine has then disappeared, and the cure is speedily announced. However, such is not the case; the urine contains a

notable quantity of insipid sugar, its specific gravity is still considerable, and we very soon see the disease return more severe than ever.

Good observers have always considered Diabetes as a dangerous disease. Aræteus has said, "Man's life is short when once this disease becomes developed," and we have but too often occasion to prove the exactitude of this remark of the Cappadocian physician; the most celebrated practitioners of the present day share this opinion. Prout says, that, out of twenty cases of this disease which he has observed within six or seven years, he only saw one in which the urine returned to its natural state, and that only for a very short time. Dr. Lubbock has never seen it yield to the means employed for its relief.* Berndt doubts very much the cure of any case of Diabetes Mellitus.† Not one out of the twenty cases treated by Dr. Parr was cured.‡ Other practitioners have been less unfortunate; thus, Dr. J. L. Bardsley, out of twenty-nine cases, lost only sixteen; out of the thirteen remaining, eight were completely cured, but he has heard nothing further of the five others.§ In the forty-one cases observed by Dr. Latham, nineteen died; nine were not cured; there were six whose condition was not ascertained,

* London Medical and Physical Journal, Vol IX.

† Encyclopædisches Wörterbuch.

‡ Medical Dictionary, art. Diabetes.

§ Cyclopædia of Practical Medicine, art. Diabetes.

and seven only recovered ; two out of this number were recent cures when the cases were published, and consequently but doubtful, and another was uncertain ; therefore there remain four recovered out of forty-one patients.*

Rollo, Beddoes, Cleghorn, Watt, S. A. Bardsley, &c., have also related some few satisfactory cases of cure ; but it is their opinion, that Diabetes is a most dangerous affection. M. Bouchardat has very recently told me, that he has completely cured two of his patients affected with this disease ; of this he was perfectly convinced, from having chemically analysed the urine, the specific gravity of which had fallen from 1.040 to 1.017. These two persons were, to all appearance, in the enjoyment of perfect health. Out of the numerous cases of Diabetes observed by this physician, these are the only two he has met with, in which the patients recovered.

It is, however, easily perceived, that the prognosis will be more or less unfavourable, according to a variety of circumstances. The intensity of the disease, the age and strength of the patient, the simple or complicated state of the affection, are very important conditions in enabling the physician to form an opinion ; for it must not be forgotten, that the urine may contain saccharine matter for a long time without any derangement to the general health. In those persons who are able to lead an easy and

* Latham. Facts and Opinions concerning Diabetes. 1811.

quiet life, the disease has been seen to be prolonged for a very long time. So long as the digestive functions go on properly, and the nutrition can repair the losses occasioned by the urinary secretion, we have reason to hope to be able to maintain the patient in a state of tolerable health ; but we must not lose sight of the frequency and importance of the complications we meet with in this disease, and we must especially recollect, that it very frequently terminates in a sudden and quite unexpected death, which no anatomical lesion can account for. The state of the respiratory organs is of the utmost importance, as regards the prognosis of the disease in question. Pulmonary consumption being in some measure the natural termination of Diabetes, we ought to pay the greatest attention, in order to ascertain the existence of tubercles in the lungs. Nevertheless, the absence of any phthysical symptoms should not lead the physician to entertain any hope of seeing his patient's life prolonged. I have generally remarked, that the characteristic signs of tubercles could only be recognised at a very advanced stage of the disease, and that when once they were observed, the affection proceeded with a frightful rapidity towards a fatal termination.

The disappearance of the saccharine matter from the urine is not always a sign of recovery from Diabetes. Several circumstances may give rise to this phenomenon. Intermittent febrile affections, while

they last, often produce a complete change in the composition of diabetic urine, the saccharine matter entirely disappearing, as we can ascertain by means of the aræometer. I have seen this effect produced, in one instance, by pleurisy, and in another by pneumonia. As soon as the intercurrent disease diminished, the sugar again formed in as large a quantity as before. Active purging or abundant diarrhœa have a powerful effect in diminishing the quantity of the urine and even of the sugar contained in it. But this effect is only momentary; as soon as the alvine function is re-established to its normal state, the alterations of the urine re-appear with the same intensity.

The disappearance of the sugar in the last stage of the disease is a very remarkable circumstance. Thus, when the symptoms of pulmonary consumption become very severe, we observe the urine gradually return to its normal condition, and retain its natural composition and specific gravity. The observer who should not be aware of this fact, would certainly be led into error by merely examining the urine. This singular phenomenon, which I have several times had occasion to observe, had already been mentioned by Cawley. Dr. Albers of Bonn* has also observed this particularity in a diabetic subject, who died, says he, of apoplexy; but, according to this author, it does not occur in those cases in which death is occasioned

* Græfe und Walther's Journal für Chirurgie, Band XX.

by pulmonary consumption. The cases which I have witnessed, prove the fallacy of the latter assertion. But, however, those of Dr. Albers show that it is not of so general occurrence as my own observations would have led me to suppose.

The *Ætiology* of Diabetes is a very obscure point in the history of this affection. Many assertions have been advanced, and yet but few are founded on facts, authors having principally formed their ideas more from theory than observation, on the causes of this malady. The following appear to me to be the most positive on this subject.

Men are more subject to it than women, a fact on which all authors agree. P. Frank has never witnessed it in women; on the contrary, out of five cases mentioned by Berndt, three were among females. Out of the seven observations published by Dr. Bardsley,* three were women, four men. This would lead us, therefore, to imagine it to be more frequent among women than is generally supposed.

No age is free from it, but it is more common between thirty and forty than at any other period of life; it has been observed in very young children. Dr. Venables, in his work on Diabetes, published in London in 1825, says it is very common in very young subjects, and that if the contrary opinion has prevailed, it is owing to its existence not having been recognised. But the observations which he gives

* Hospital Facts and Observations, 1830.

are not conclusive, nor evidently relate to Diabetes. However, very evident cases of Diabetes Mellitus in young children have been related by Morton, Watt, Mac Gregor, &c. This disease appears excessively rare at the *Hôpital des Enfants Malades*, at Paris; M. Baudelocque, one of the physicians to this establishment, has not seen a single case of it during ten years' practice; it seems to be of more common occurrence among old men.

According to some authors, climate is an important predisposing cause, cold and damp climates being those in which it is most frequently observed. This is, however, a question which is far from being decided. Thus Dr. Lefèvre asserts that it is unknown in Russia.* P. Frank has witnessed it more frequently in Italy than in Germany. It is observed at Bengal,† and Dr. Christie has frequently met with it in Ceylon; in a few years he saw as many as twelve cases, although his practice was not very extensive. Several of the native physicians assured him it was by no means an uncommon disease in that country.‡ I own I have some difficulty in relying on Dr. Lefèvre's assertion; it is strange that a disease common in Poland, Sweden, and Norway, should not be met with in Russia. In England, Diabetes is very common: thus, Latham has treated

* London Medical Gazette, Nov. 29, 1837.

† Transactions of the Medical Society of Calcutta, Vol. IV.

‡ Edinburgh Medical and Surgical Journal, Vol. VII. p. 285.

more than twenty cases; Parr, about the same number; J. L. Bardsley, twenty-nine. Every year, according to the last-named author, several examples are met with in the Manchester Infirmary. Prout witnessed, in a few years, about twenty cases; and Dr. Babington, in a very short time, in London, was able to collect twenty-three cases.* Diabetes seems still more common in Edinburgh than in London, according to Dr. Elliotson. In France it is not a very rare disease; there is not a year without there being several such cases in the Paris hospitals. M. Rayer tells me he has seen more than fifty cases, and I have myself observed more than twenty.

Such are the predisposing causes, and but little more is known of the exciting causes. In this category have been considered living in a dark and damp situation, with want of proper and sufficient food, a vegetable diet, exhaustion caused by hard labour, excess in venery, an immoderate use of liquors of a diuretic kind, especially tea, or of spirituous liquors, a sedentary life immediately following one of an active nature, keeping wet clothes long on the body, &c., &c. Sadness, a distressed state of mind, profound grief, in short, those passions which have a depressing action on the nervous system, are the causes which have appeared to me to possess the most efficacy in occasioning Diabetes. Cases have

* Willis on Urinary Diseases, p. 197.

been mentioned, in which the disease appeared to have been brought on by pregnancy, by the suppression of accustomed discharges, of an abundant salivation, or of the perspiration of the hands or feet.

Some authors have asserted that Diabetes might be hereditary; and this assertion, which at first appears rather singular, is not, however, without some semblance of foundation. Prout has seen three cases which appear to confirm it; one is that of a young man whose mother and uncle had died of the disease; the second was that of a lady of fifty, whose brother and sister had been its victims; and the third was that of a young girl ten years of age, whose father had been affected with the same disease. Other authors have witnessed facts of the same nature. Dr. Storer met with three cases of Diabetes in the same family—in a brother, a sister, and her daughter; the father had died of the same disease. In a case related by Dr. Leigh Thomas, three brothers were attacked with the same affection. Isenflamm has seen seven children in the same family successively attacked with it. It is possible, that these coincidences might be attributed to the circumstances under which the patients were placed, rather than to any hereditary disposition; however, this cannot altogether be rejected.

Nature of Diabetes.—It is in general of but little use to study the nature of diseases, as it is more a field for fancy than for observation. So obscure an

affection as Diabetes could not fail to be the subject of numerous theories ; but to give a list of all the opinions that have been given on the subject, would be nothing less than forming a catalogue of the aberrations into which the mind of the physician may be drawn, when he abandons himself to the sole resources of his imagination. I only intend, therefore, noticing a few of the most plausible theories that have been published on this disease.

Some consider it a modification of the secreting function of the kidneys, a modification which each explains according to his ideas ; others suppose it to be an hypersecretion ; while by others it is looked upon as the result of paralysis of the renal nerves, or of an exaltation in their functions. According to Wollaston, there is a change in the electric conditions of the kidneys, &c. ; a second theory places the seat of this disease in the digestive organs. This has been the prevailing theory in England, where it was strongly upheld by Rollo. Nicolas and Gueudeville partly adopted it, but added, "*a continued spasmodic deviation of the non-animalized nutritive juices on the urinary organs,*" an explication which, as may be seen, is by no means remarkable for its lucidity, so little so, indeed, that it is very probable the authors did not understand themselves. Mac Gregor's experiments certainly tend to support Rollo's opinion ; but they require repeating.

Another manner of explaining the nature of this

affection, is by an alteration of the blood. The discovery of saccharine matter in this fluid, and in most of the secretions, the numerous functional lesions observed in this disease, are so many circumstances in favour of this opinion. Would this alteration in the blood be owing to an imperfect nutrition, to a change in the composition of the chyle, &c., &c. It is impossible to affirm it, for this is as yet only a supposition.

As to the chemical theories on the formation of sugar, they appear more satisfactory. Organic chemistry is yet but too little advanced for us to expect from it a complete explication of phenomena so obscure, so complicated as those of Diabetes. Prout having proved the great analogy in composition, which existed between sugar and urea, and that the only difference consisted in the urea containing nitrogen, an element totally absent in sugar, the idea which immediately followed was, that the sugar in diabetic urine depended on the transformation of urea into that substance. Coindet even made some experiments which appeared to him to confirm the idea that the lungs of diabetic patients gave off more nitrogen than those of healthy individuals.* But if this theory were true, it was necessary that the proportion of urea should exist in an inverse ratio with that of the sugar, an opinion then generally admitted, but which recent researches have entirely refuted.

* Bibliothèque Universelle de Genève, Sciences et Arts, Tome XXX, p. 507. 1825.

M. Bouchardat, in a very interesting notice on Diabetes which he has published in the *Revue Médicale* for June, 1839, proposes another chemical theory. According to him, the sugar present in diabetic urine, is formed by the transformation of the fecula of the food in the stomach, a transformation which takes place, owing to the action exerted between amylaceous substances and ferment, gluten, albumen, or fibrine, in certain altered conditions. The same phenomena take place there, that we observe in the laboratory. M. Bouchardat adds, that he has also remarked, that the thirst of diabetic persons is in a direct ratio with the quantity of saccharine matter, or fecula contained in the food they take, and if this sort of food be diminished or suppressed, the nature of the thirst assumes immediately a different character. He moreover affirms that the fixed proportion of sugar in the urine, is in constant relation with the quantity of fecula or saccharine matter contained in the food.

This theory is engaging. It explains certain facts which would not otherwise have been clear or satisfactory. It is true that it is not entirely new, as it sets forth, only in a more precise and scientific manner, the opinions Rollo had given of the manner in which diabetic sugar is formed. Mr. Mac Gregor's experiments have been of great importance towards maintaining this theory. This skilful observer has often found saccharine matter in the half-digested

food vomited a few hours after a repast. When the aliment contained vegetable matter, the quantity of sugar was considerable. In a diabetic patient, who was fed upon beef and water for several days, and made to vomit about four hours after each repast, the matters vomitted fermented with much less rapidity than in those patients who eat vegetable substances. The same experiment was repeated on two other patients, and it gave the same result.

The experiments made some time ago by Dr. Krimer complete, in a measure, the series of inductions which we draw from the results obtained by Mr. Mac Gregor. Dr. Krimer injected diabetic urine into the stomachs of various animals, (dogs, rabbits, &c.). The following are the conclusions he came to.* When diabetic urine is introduced into the stomach of an animal, we find on the following day saccharine matter in its urine, and continue to do so, so long as we administer this substance, and even some days after we have ceased to inject it. (Experiments 5 and 6.) The animals to which diabetic urine has been given for a certain time, do not become affected with Diabetes, neither does their health appear in any way to suffer from it.

When a small quantity of syrup of the sugar extracted from diabetic urine is injected into the veins, we find, after a certain time, saccharine matter in the

* Horn's Archiv fur Medizinische Erfahrung, 1818, B. II. p. 494.

urine, and in both sets of blood vessels ; but, if immediately after the injection we place the animal in the electric current of a powerful voltaic pile, we then neither find any saccharine matter in the blood, nor in the urine, and it is the pulmonary transpiration that appears to contain it. (Experiment seven.)

By injecting into the vessels a solution of cane sugar, we do not find that the sugar passes into the blood or urine, but by the pulmonary transpiration. We know that cane sugar, taken into the stomach in whatever quantity, never passes by the urine.

Diabetic sugar formed or introduced into the stomach would seem, therefore, to have the property of being eliminated by the functions, exactly in the same manner as arsenic, alkaline salts, and numerous other substances.

The explication of the manner in which Diabetes is produced, would therefore be perfectly simple ; the sugar, formed in the stomach by the action of the albumen, the fibrine, or the gluten, on the feculent matters, an action perfectly similar to that which diastase has upon fecula,—the sugar, I repeat, would become absorbed, and carried into the circulation, whence it would be eliminated by all the secreting surfaces, especially by the kidneys.

This theory certainly appears, at first sight, satisfactory ; but unfortunately, there are facts which entirely overthrow it. Thus, Mr. Mac Gregor found saccharine matter in the stomachs of persons

in whom vomiting had been produced, and who had been kept for several days on a very strict animal diet. Whence could arise the saccharine matter in this case? No substance capable of being transformed into sugar had been taken. The theory remains silent, and gives no explanation of the fact.

The modification occasioned in the constitution of the urine by a purely animal diet is sufficiently marked. However, it does not go so far as to cause the disappearance of the sugar. Prout had already mentioned the circumstance: "I have watched," says he, "the effect of an exclusively animal diet on the urine of diabetic patients. In most instances it seems to lessen the quantity and deepen the colour of the urine, and thus to disguise the saccharine matter present; but, as far as I have been able to ascertain, it does not diminish the specific gravity of this secretion."* Dr. Venables, who paid some attention to this subject, is satisfied that a diet exclusively animal is of no great advantage. M. Bouchardat himself relates the case of a patient who, after strictly adhering to a purely animal regimen for a long time, presented still in his urine a notable quantity of sugar.

In Dr. J. L. Bardsley's *Memoirs on Diabetes*,† we find several patients, who were put upon the strictest animal diet, (both meat and drinks acidu-

* *Treatise on the Diseases of the Urinary Organs*, p. 79.

† *Hospital Facts and Observations*, 1830, p. 168.

lated with nitric acid,) continue to evacuate, during a very long time, urine much loaded with saccharine matter; and the author declares that only in one case this treatment caused the disappearance of the mellitic state of the urine. Drs. Lubbock and S. A. Bardsley had already noticed that the animal diet was not sufficient to deprive the urine of the saccharine matter, which is contrary to what Rollo had asserted.

Nevertheless, it must be acknowledged, that this regimen generally exerts a very marked influence on the composition of the urine in Diabetes. Thus, when the patients have remained a long time without eating, the urine becomes almost entirely deprived of saccharine matter, but becomes charged with it a very short time after the repast. The general effect of animal diet is to diminish thirst, and consequently the abundance of urine. But these effects are not exclusively produced by alimentation; they are equally evident from the employment of therapeutic agents, blood-letting for instance, or the preparation of opium, &c.

We must further remark, that if M. Bouchardat explains the manner in which diabetic sugar is formed, he in no way makes known the circumstances under which this chemical action of the albumen on the fecula takes place in Diabetes, and why it is not formed in the healthy individual. On this rests the whole problem. Therefore we are justified in

saying, that all the hypotheses made on the nature of Diabetes are still unsatisfactory; because the subtlety of mind is not sufficient by itself to discover the truth, and because we are still too ignorant of several points in the history of this disease, to be able to find out its proximate cause.

Treatment.—The means of cure in this affection are almost as little known to us, as are its nature and causes; consequently, they are often totally opposite, some being employed from theoretic views, while others are quite empirical. However, we must not forget, that we do not, perhaps, possess a single remedy capable of producing a complete cure of the disease, and that we must be very cautious as to admitting those cases published in the medical journals as examples of recovery, since most of the necessary details are wanting. But, on the other hand, we must recollect, that we are often enabled to ameliorate the state of the patient, so as to stop the progress of the disease, and to place him in such a condition that, during several years, he may enjoy tolerable health; whilst, if left to himself, he would have sunk in the midst of torments which accompany this terrible affection.

The remedies extolled as specifics against Diabetes are very numerous, but few only are of real use.

1. *Blood-letting.* Watt was the first to recommend this remedy, as the basis of the treatment of this malady. He did not fear to have recourse to it,

even in cases which appeared contra-indicated by the exhausted state of the patient, by the smallness and weakness of the pulse, and the œdema of the lower extremities ; and he asserts it had always a favourable effect. Watt's example was followed by many other English physicians ; Drs. Murray, * Ayre,† Satterley, Kennedy,‡ &c., have derived great advantage from its employment. Dr. Elliotson, who has often had recourse to general bleeding, says it is quite certain that great benefit is derived from it, and that the patients support it very well. But he guards against a too copious bleeding, such as would produce syncope. He has often seen the quantity and composition of the urine become very decidedly ameliorated under its influence, as well as the thirst diminished, and a renewal of the cutaneous transpiration take place. Yet he does not contest its occasional inefficacy.§ Dr. J. L. Bardsley, who has made some careful experiments, as to the value of bleeding as a therapeutic agent in Diabetes, has only found it beneficial during the acute stage of the disease. At any other period it gives no relief, and only weakens the patient. Consequently he considers it an exceptional means of treatment, and recommends it at the commencement of the disease, in plethoric subjects, where the strength is considerable,

* Edinburgh Medical Journal, Vol. VIII.

† Lancet.

‡ Calcutta Transactions, Vol. IV.

§ London Medical Gazette, Vol. XII. p. 730.

especially when there is some excitement of the lungs.*

Many physicians prefer local evacuations of blood from the lumbar region, and these are very useful when there is any pain in the region of the kidneys; but they are more especially useful in the relief of pain in the epigastrium. Marsh† and J. L. Bardsley have always succeeded in relieving the pain in epigastralgia, and thus do not fear their frequent application, as no notable weakness is occasioned by this manner of abstracting blood. In a case observed by Dr. Forbes, the application of leeches to the epigastrium was immediately followed by a change in the composition of the urine, which assumed its natural qualities. This amelioration was only transitory, the same effect being observed, only in a less degree, at each successive application of the leeches.‡

2. *Animal Diet*, first proposed by Dr. Home, was more especially recommended by Rollo, as the most sure means of curing Diabetes. He combined it with the internal administration of sulphuret of ammonia, antimony, and opium. Rollo's treatment was tried in a great number of cases, and we are now tolerably acquainted with its value. The opinion of Nicolas and Gueudeville, of Dupuytren and Thenard, that a purely animal diet "*has the same effect in Diabetes*,

* Cyclopædia of Practical Medicine, art. Diabetes, Vol. I. p. 546.

† Dublin Hospital Reports, Vol. III.

‡ Cyclo. of Pract. Med. Vol. I. p. 546.

as bark in intermittents,"* would not find a single supporter. But we cannot deny that it is one of the most useful remedies that can be employed in Diabetes. Unfortunately, there are several circumstances which prevent its being had recourse to. Among the poor, the price of it becomes the first obstacle. But it is chiefly the disgust the patient feels against this kind of nourishment, that becomes an almost insurmountable difficulty to its employment. At the same time, the digestive organs are in such a condition, that the stomach cannot digest a great mass of animal substances; under these circumstances, this kind of alimentation brings on indigestion, which in these patients is frequently the forerunner of death, as Prout and many others after him have remarked.

However, with some precautions, the inconveniences attending this mode of alimentation may in a great measure be prevented. The patients may be allowed, without danger, several kinds of non-feculent vegetables, such as sorrel, endive, lettuce, cresses, spinach, artichokes, &c., eggs, and all kinds of fish; and there would be no harm in allowing a few ounces of bread; but all feculent or saccharine substances must be strictly prohibited.

While we are ordering the nature of the food, we should also be careful to limit the quantity as much as the hunger of the patients will permit.

* Dupuytren et Thenard sur le Diabète, in the Journal de Corvisart.

As drink, a little good wine, and an infusion of bitter herbs, should be taken.

This light and varied regimen is sufficient to moderate, in a very short time, the accidents arising from Diabetes. It has the great advantage of not fatiguing the patients, of causing them no unpleasantness, and consequently of being able to be persevered in for a sufficiently long period; we are thus enabled to guard against the dreadful indigestions occasioned by an exclusive use of fat meat, especially rancid bacon and ham, so much extolled by Nicolas and Gueudeville, and by Dupuytren.

It will be easily imagined that certain complications of Diabetes are contra-indications to the use of an animal regimen; such are, inflammations either of the digestive, respiratory, or uropoietic organs, which so frequently supervene on this disease. Its most general effect is a diminution in the thirst and quantity of urine excreted; this frequently loses its sweet taste, and its specific gravity becomes slightly diminished. The patient at the same time gains strength and embonpoint, so that he thinks himself cured. But the urine remains heavy and is easily fermented, while very slight causes, such as change of diet, exposure to cold or damp, or any brisk emotion, may bring back very severe symptoms of the disease. Yet, with proper care, the amelioration occasioned by the animal regimen may last for several years, and an existence which, if left to nature

alone, would have been miserable, may be rendered tolerable. This is an advantage sufficiently great, for patients to make some few sacrifices to obtain it. As it is difficult to subject them, for any length of time, to the exclusive use of animal matter, we should be careful to give only those vegetable substances which contain less saccharine or feculent matter. Not that their employment would be so dangerous as M. Bouchardat imagines, since certain authors, led, like himself, by theory, have given a purely vegetable diet, and, they assure us, with success. But the great number of cases in which the utility of an animal regimen has been incontestable, ought to make us consider these facts as exceptional, and render us very circumspect in the employment of a remedy which may be followed with sad results.

3. *Opium* is one of those remedies which have been recommended with the most reason, as having great influence over Diabetes. Willis considered it of great use. His opinion, in which he was supported by Darwin, did not draw much attention until after the publication of Dr. Warren's observations in the fourth volume of the *Medical Transactions*. This physician, by means of this remedy, given in one case to the amount of 12 grains in one day, and 20 in another, caused all the severe symptoms of the disease to disappear, as well as the sweet taste of the urine. Since then, opium has been much employed, and nearly all authors assert, that its effect is to di-

minish thirst and the quantity of urine, to re-establish the cutaneous transpiration, and to moderate hunger. Some authors imagine it is necessary to carry the dose of it to some extent. Thus, Ware gives 40 grains, Elliotson 48, and Tommasini 60 gr. But the most experienced physicians recommend it in moderate doses. Dr. Bardsley is of this last opinion, having rarely had occasion to exceed six grains per day. He prefers the salts of morphine, employed by Elliotson, as they appear to cause less headache or constipation. It is, however, very remarkable with what facility diabetic patients support really prodigious quantities of opium without any narcotic symptoms showing themselves, even when the dose of the remedy has been rapidly increased.

Attentive observation enables us to assert, that opium or its preparations may be considered as a therapeutic agent of the most energetic action on Diabetes; but, unfortunately, only as a palliative remedy. Elliotson, by whom it has been much employed, does not assert ever having cured a single patient by it, although a great many were much relieved. In the seven cases related by Dr. J. L. Bardsley, as treated by opium, each patient, when last observed, presented urine of a specific gravity above 1.020, which leads us to doubt a complete cure, especially as the presence of sugar was not ascertained by chemical examination.

4. *Astringents* also enjoy a certain reputation in

the cure of Diabetes. They were formerly much more employed than at the present day. Their efficacy is certainly much less than that of any of the other means of treatment just mentioned. Lime water, decoction of oak bark, catechu, kino, uva urei, diosma, rhatania, solutions of alum or sulphate of iron, mineral lemonades, have each in their turn been employed, seldom alone, but generally in combination with more active remedies.

The same may be said of *Tonics*, which can be considered only as auxiliary means. They are principally necessary when there is general weakness or debility of the digestive organs. It is under these circumstances that much good effect has been derived from the employment of ferruginous waters or slight bitters. It is at this period that patients obtain so much benefit from a country or sea air, from slight exercise, or nourishing and restoring diet.

5. *Warm Baths* act in a very favourable manner by restoring and re-establishing the cutaneous transpiration ; and for this reason should be considered as very useful auxiliary agents in the treatment of Diabetes. They are generally preferable to vapour baths, which were held in such high esteem by Marsh ; the latter, on account of the abundant transpiration which they produce, determine a more rapid diminution in the quantity of the urine ; but this effect is only momentary, and the employment of the vapour bath is followed by weakness, which ought if

possible to be avoided. On this account, therefore, it is never employed, except in particular cases.

I shall only mention a number of other remedies favourably spoken of by only two or three persons, but which have entirely failed in the hands of other physicians. Such are phosphoric acid and its salts, recommended by Latham; phosphate of iron, extolled by Venables; phosphate of soda, spoken so highly of by Sharkey; ammonia, magnesia alkaline, sulphurets, mercury and its different preparations, colchicum, emetics, purgatives, anti-spasmodics, cantharides, creosote, turpentine, copaiba, cubebs, urea, ammoniated sulphate of copper, &c.; which have all been said to succeed, but which much more frequently have failed. It is useless remaining longer on this subject.

We have seen that the animal regimen, opium, warm baths, and blood-letting, were the most efficacious remedies in relieving the severest symptoms of Diabetes. It is always useful to combine them together, and not to trust to one only. Thus opium, animal diet, and warm baths, have always succeeded in Dr. Bardsley's hands, if not in curing, at least in greatly alleviating the symptoms. Others add tonics and astringents, when the stomach can bear them. It is only in those cases where these means prove useless, that we are authorised in having recourse to others, of certainly much less efficacy.

In addition to these therapeutic means, hygeine

may with advantage be employed, as it has great influence over the disease. Living in a healthy and airy situation, warm clothing, moderate exercise, according to the strength of the patient; agreeable distractions, so as to maintain the moral perfectly calm, &c., are useful auxiliaries. But the patients should continue the treatment for some time, as a suspension of it, even for a very short period, is sufficient to bring back symptoms quite as severe as in the first attack, when the therapeutic agents will often be found to have lost all their efficacy. In these cases, a change in the mode of treatment is a most valuable resource, and the employment of exceptional means is found to be fully justified.

DIABETES WITH FATTY MATTER.

*(Milky Diabetes, Chylous Diabetes, Urinary
Lienteria of Authors.)*

This form of the disease is extremely rare. Ancient authors have spoken much of it, though apparently much less from observation than theory. At least, the number of authentic facts of this affection is but very small indeed, and in every one there are some necessary details wanting; consequently it becomes difficult to establish from them a history of this form of Diabetes. It appears to us, therefore, more con-

venient to place before the reader the documents we possess on the subject, at the same time drawing from each, as much as possible, the conclusions which will appear to us most naturally to flow from it. This method seems the most suitable to adopt, as many recent authors, Dr. Christison for instance,* appear to us to have thrown on this subject great confusion, which we will endeavour to avoid.

The following passage of P. Frank† is the first authentic instance of Fatty Diabetes. “The *Milky* Diabetes of authors, or the urinary lienteria, (fluxus cœliacus urinalis,) appears to consist in the whitish coloured urine which is excreted sometimes in perfect health, when we fatigue ourselves by walking after a copious repast. A mixture of pus with the urine may be mistaken by many physicians for chyle; however, we do not deny the existence of *Milky* Diabetes. A septuagenarian has given us a proof of it in the Hospital at Pavia. This patient carried for a long time a heavy weight on his shoulders; eight days after this effort, he was taken with intense pain towards the last lumbar vertebræ, febrile symptoms at intervals, with evening exacerbations; he complained of excessive thirst, and excreted a large quantity of urine resembling milk. He evacuated daily, for several months, from sixteen to twenty pounds of this sweetish liquid, a quantity much su-

* *Library of Practical Medicine*, Vol. IV. p. 261.

† *De Curandis Hominum Morbis Epitome*, Vol. III.

perior to that of the fluids swallowed, although he drank abundantly. His inextinguishable thirst and excessive hunger, the disappearance of his embonpoint, and its being succeeded by marasmus, compared to the quantity of urine, proved that the wasting depended on Diabetes, and not upon any purulent matter. Similar cases of *Chylous* Diabetes are to be found in authors, which it would be difficult to attribute to any internal suppuration."

Vogel relates in a very diffuse manner, but still too briefly with respect to the important details, a curious case of this disease :

"A gentleman of high rank, about seventy years of age, accustomed to drink wine, particularly the Franconi, in rather large quantity, who, from very active habits had become very sedentary, who had had slight attacks of gout, and who was much disposed to sweating, so as to perspire abundantly every night without being weakened by it, but on the contrary, was in perfect health, became gradually attacked with Chylous Diabetes.

"This person sensibly lost his strength and embonpoint; he had pains in his feet, agitated and sleepless nights; he completely lost his nocturnal perspirations; the skin became perfectly dry, and the thirst excessive; he experienced a sense of burning heat in the viscera of the abdomen, and was likewise tormented by a painful sensation, extending from the lumbar regions as far as the bladder, and by a diffi-

culty in making water. The urinous excretion was much too abundant, *the urine itself was milky*, and, when left to itself for some time, deposited a very copious milky sediment. The chemical examination made of, it is true, a very small quantity of it, by my ancient colleague Dr. Juch, now professor at Munich, showed that *it was of a chylous nature*. I have forgotten the details of the chemical process.

“In a very aged person, to whom very unpleasant affairs had latterly occurred, and in whom the disease had already lasted for some time, we could have but little hopes of a favourable termination,—at least, it was difficult to believe the recovery would ever be complete; for, generally, in similar cases, the best cure, even when it is obtained, is not lasting.—The causes which appear to have produced the disease were, the suppression of the perspiration and the deposit of the gouty (arthritic) matter in the interior of the body. Perhaps even this gouty matter was the cause of the suppression of the perspiration. These two circumstances, or at least one of them, appear to have acted on that part of the lymphatic system which belongs to the urinary passages, in such a manner as to cause a retrograde movement of the lymph, and the chyle to be conducted out of the chyliferous vessels into the urinary ducts.

“This consideration decided me to adopt the following treatment:—to act upon the gouty matter by means of guaiacum resin and the effervescing powder;

to direct its action to the skin by means of the spirit of mindercrus (*the Liq. Ammon. Acet. P. L.*), combined with the Tinctura Thebaica (*Laudanum*), and thus at the same time re-establish the perspiration; to diminish by emollient glysters the irritation of the bladder; to withdraw the internal irritation externally, by the application of a blister to the arms; to procure a more equal division of the lymph, and in this manner give more liberty to the affected part of the lymphatic system. With these views I prescribed the following mixture:

R. Guaiaci Lign. 3 ij.
 Gom. Acaciæ, ʒ iv.
 Aq. Mellissæ, 3 vj.
 Inf. Cinnamoni, 3 vj.
 Ol. Vitrioli Dulc. ʒ ij. *
 Sacchari, ʒ ij. M.

Of this I gave daily two or three table spoonsful. I ordered him also to take the effervescing powder, composed of tartaric acid, natural neutral salts and sugar, in equal proportion. I also prescribed, as I have before said, the spirit of mindercrus, in doses of an ounce, with two scruples of the Tinctura Thebaica. From 48 to 60 drops of this mixture were given night and morning in almond emulsion.

“As a lavement, I chose a decoction of the leaves of mullein, with the yolk of an egg and ten drops of laudanum, in order to alleviate the tenesmus of the

* The Spiritus Etheris Sulphurici P. L.

bladder, and stop the liquid evacuations from the intestines. I also recommended warm baths, to diminish the contraction of the skin and the absorbent vessels which arise from it ; but they were not very often employed. I also endeavoured to produce a strong irritation on the nerves and vessels of the bladder and urinary passages, by means of a stimulating liniment composed of an ounce of volatile ointment, a drachm of tincture of cantharides, and fifteen grains of camphor, which the patient was to rub over the lumbar and sacral regions.

“In order that these remedies might better produce the desired effects, I continued to employ them for nearly a month without interruption. At the expiration of this time the guaiacum mixture was suspended ; and as I found it necessary to give strength to the weakened intestines, and especially to the urinary passages, I prescribed the following strengthening remedy :—To be dissolved, one drachm of extract of cinchona, half a drachm of iron with apple juice, in four ounces of infusion of camomiles and one ounce of infusion of canilla ; to be added to this, two scruples of sweet spirits of vitriol, and five drachms of syrup of orange peel. The patient took of this daily four table spoonsful. The effervescing powder was employed over the region of the kidneys, which was also fomented frequently with hot wine. These remedies were persevered in for nearly a month longer.

“The strengthening mixture acting too powerfully,

(for the tenesmus of the bladder increased rather than diminished,) I substituted the following:—I dissolved half a drachm of extract of cascarilla, and two drachms of gum acacia in five ounces of infusion of fennel seed and six drachms of infusion of canilla; to this solution I afterwards added the sweet spirits of vitriol and the syrup of orange peel; the patient, who was getting better, took two table spoonsful of it three times a day. At the same time, a stimulating liniment, composed of an ounce of spirit of wild thyme and four scruples of tincture of cantharides, was employed to rub over the sacral and lumbar regions once a day.

“These means united had at last the desired effect; the urine regained its natural properties, both as to quality and quantity; the nocturnal perspiration returned, the lost strength became re-established, sleep was more tranquil, the body resumed its embonpoint, the disagreeable sensations and pains in the feet disappeared, and the excessive thirst ceased; in a word, the economy returned to its natural condition. This cure was gradually obtained in between three and four months, by means of the remedies above mentioned, and the regimen which was followed; three years have elapsed without any fresh attack having occurred.

“The patient was in danger of losing his life this spring from another affection. He has been tormented by an extremely obstinate mucous cough,

affecting both the stomach and the chest, which was very nearly bringing on consumption. However, he again recovered by means of suitable remedies."

There is a great analogy between these two cases. They both relate to old men, who, the one from the effect of a somewhat active cause, a violent effort ; the other from having become very sedentary after a life of great activity,—are taken with symptoms very similar to those of Diabetes Mellitus—excessive excretion of urine, inextinguishable thirst, voracious appetite, rapid emaciation, fever, suppression of accustomed nocturnal perspirations, dryness of skin.

The urine had the character of being thick like milk, and gave an abundant milky sediment, when set at rest. But what was its chemical composition? It is difficult to say. In Frank's case it was sweet ; but apparently no researches were made to ascertain its composition, or even to recognise the presence of sugar, which is very probable, since it had a sweet taste. In the case mentioned by Vogel, an analysis was made, and the presence of chyle was proved. It is, however, much to be regretted, that the author was unable to give the details of the chemical analysis by which he was enabled to recognise the chylous nature of the urine. It is very likely that the presence of fatty matter was merely proved, and a conclusion drawn that it was owing to its containing chyle. Neither does Frank appear to have had any reason for designating, by

the name *Chylous Diabetes*, the case we have related above. It was the result of his theoretical ideas.

The following case related by Dr. Prout, although presenting but a few symptoms of Diabetes, and consequently leaving some doubts as to its perfect identity with the disease before us, gives us much more satisfactory details respecting the composition of the urine. The patient (a female aged 30) had an exaggerated appetite as well as thirst, and a few other symptoms resembling those of Diabetes Mellitus; yet her constitution was but little altered. A very remarkable symptom with her was a spontaneous coagulation of the urine in the bladder, and of course a very great difficulty in voiding it. Three samples of this urine, evacuated at different hours in the day, were carefully examined. The first, emitted in the morning, formed into a solid mass like jelly, of a rather pale amber colour; when pressed, a large quantity of a yellow serous fluid exuded from it. The solid part became much diminished in size, and had the appearance of a red fleshy mass, of a fibrous texture, presenting all the characters of the fibrine of the blood, mixed with a few of the globules of this fluid. The liquid portion had a specific gravity of 1.019, and a slight urinous odour; it was without action either on litmus or turmeric papers, and contained a large quantity of albumen, a little urea, and was coagulable by heat.

The second sample, evacuated shortly after dinner, greatly resembled the first, except that the liquid portion was less characterised, and that the coagulum, more compact and more firm, contained more globules of the blood.

Lastly, the third sample, evacuated several hours after dinner, so strongly resembled chyle, that it was impossible to distinguish the difference. It consisted of a very solid white clot, presenting the form of the vessel, and intermixed with stripes of a less consistence and of a red colour. The portion of liquid obtained by slight pressure was white and opaque like milk, and when heated and afterwards set at rest, a stratum similar to cream, containing a considerable quantity of the buttery principle, formed on its surface. Its specific gravity was 1.0175; it had a very slight urinous odour, presented a few traces of urea, and was not coagulated by heat, although it contained a considerable quantity of albumen and fatty matter.

This patient's urine was examined after twenty-four hours' abstinence. The coagulum was then very much smaller, and appeared to contain more red particles. The liquid portion was almost transparent, and possessed to a very high degree the colour and the other properties of normal urine. Its specific gravity was 1.021, and was very abundant in urea and albumen. The patient was not submitted to any treatment. Five years afterwards she appeared

in good health, and in the interval had become pregnant and was favourably delivered. But her urine had remained in precisely the same state.

In this case one single character is wanting to enable us to affirm that the urine in question really contained chyle ; I mean the presence of the chylous globules recognised by microscopical examination. However, even in the absence of this characteristical sign, we may admit the chylous nature of the urine, for no other substance could communicate to it the property of spontaneously assuming the form of a white clot, containing in its meshes an albuminous and fatty liquid.

We are indebted to Dr. Venables for a very curious case of Diabetes, in which the urine contained a certain quantity of oily matter.* This physician was consulted on the 9th of May, 1829, by Mr. T. P., for an œdematous, though not painful swelling of the right knee. He complained, however, of great pain in all his limbs, and, as he termed it, of *great fever in his stomach*. The lips were dry and parched, the tongue dry and coated with fur, the saliva viscid, concreting on the angles of the mouth, thirst urgent, appetite good, but not voracious, no emaciation, bowels regular, pulse 96, respiration free and regular, the urine natural in quantity (two or three pints per diem). The patient was very stout, of a florid com-

* London Medical Gazette, April 6, 1839, p. 36.

plexion; he could give nothing certain or precise relative to the prevailing family diseases, only that his mother or grandmother had died with pulmonic symptoms.

Dr. Venables desired him to make water before him; the quantity evacuated amounted to about half a pint, which was of a yellowish green colour; its specific gravity was 1.035, its taste sweetish, and it yielded, when properly treated, a tolerably large quantity of sugar.

Three specimens of Mr. P.'s urine were examined on the 10th of May; that evacuated in the night had a specific gravity of 1.035; the second, early in the morning, weighed 1.0367; and the third, after dinner, gave 1.040. All three were of a pale straw colour, perfectly transparent, and without cloud or mucus, and contained a certain proportion of fatty or oily matter.

Three specimens passed on the 12th of May, presented the same general characters; the one passed the preceding night weighed 1.041, reddened litmus, and contained sugar; another, evacuated in the morning, had a specific gravity of 1.040, was sweetish, and deposited a small quantity of lithate of ammonia; and that passed on the morning of the 12th, contained so large a proportion of urea, that, on the addition of nitric acid, it became in an hour an almost solid crystalline mass. Its specific gravity was 1.035. This patient underwent a prolonged medical treat-

ment, so that the state of the urine was frequently examined.

This case is an example of commencing Diabetes, with alternative predominance of the saccharine principle, urea, and fatty matter. It is extremely interesting to us, on account of the connexion it establishes between the different states of the urine we have just examined; it goes far to refute the opinions of modern authors, who separate these varieties of the same malady. It is only to be regretted that Dr. Venables has not related the symptoms with all the necessary details. The same author also mentions the case of a lady, whose urine, evacuated in the afternoon, had a specific gravity = 1.037, containing a considerable quantity of saccharine matter and but little urea, whilst that of the next morning contained a large quantity of urea, with a specific gravity only of 1.026, was of a pale colour, rather opaque, *appeared* to contain an oily or fatty matter, gave an abundant sediment, and produced a large proportion of lithic acid.

Dr. Graves, in his Clinical Lectures,* has mentioned a case of Diabetes which has a great deal of analogy with the preceding. In the urine of a patient who complained only of emaciation, weakness, and thirst, and who was affected with Diabetes, Dr. Aldridge could not discover any saccharine

* London Medical Gazette, April 15th, 1837, p. 68.

matter, but found a peculiar animal substance, which he considers to have been *caseum*. Unfortunately, Dr. Graves goes into no particulars as to the properties of this urine, and gives no account of the chemical experiments by which it was ascertained that this substance was supposed to have been *caseum*. More recently, Dr. Aldridge has given some fresh details relative to this case.* This urine, eight pints of which the patient evacuated daily, was pale, almost transparent, slightly acid, and of specific gravity 1.011; it contained as much urea as urine of so aqueous a nature could do, and was coagulated by nitric acid and the voltaic pile, but was not in the least changed by heat, unless an excess of acetic acid was added, and then an abundant precipitate was formed. These details are far from sufficient to establish the presence of *caseum*; neither does Dr. Aldridge positively assert that it was really this substance which he discovered, but he thinks its properties resembled much more those of *caseum* than of albumen. This fact, though somewhat uncertain, must render us very cautious in absolutely rejecting the existence of *Milky Diabetes*.

The details into which we have just entered, enable us to recognise in Diabetes with Fatty Matter the principal symptoms of Diabetes Mellitus, only in a less degree; that the urine has the character of

* Dublin Journal of Medical Science, Vol. XV. p. 125, No. for March, 1839.

being cloudy, lactescent, sometimes spontaneously coagulable, of possessing a specific gravity but little above the natural standard, and of becoming bright when treated by ether, and of furnishing a more or less considerable quantity of fatty matter. Instead of this fatty matter there may be a kind of oil, immiscible with the urine, which then remains perfectly transparent, as in the case related by Dr. Venables.

The diagnosis of this affection merits our attention for a moment, as it is important to distinguish it from some other diseases with which it appears to have been hitherto confounded.

There is an alteration of the urinary secretion which appears endemic in certain hot climates, especially in Mauritius and in Brazil. The patients generally excrete a sanguineous urine, which sometimes becomes whitish and cloudy, and then contains a more or less considerable quantity of fatty matter, or even, according to some authors, real chyle. It then has a very great resemblance to the urine in Diabetes with Fatty Matter. But the phenomena of the two diseases enable us to distinguish them. The increase in the quantity of urine, the aggravated hunger and thirst, and the derangement in the nervous functions, exclusively belong to Diabetes. It is also probable that, in this last affection, a certain quantity of saccharine matter always exists in conjunction with the fatty matter. In those cases of albumino-fatty urine, endemic in hot countries, the

health is not in the least degree deranged. Moreover, in the cases in question, the urine often resumes its normal composition for a time ; at other times it contains a more or less considerable quantity of blood. These characters, with the particular situations in which this latter affection is witnessed, will always suffice to enable us to establish a diagnosis. However, for further details I refer the reader to a very interesting paper by M. Rayer, in which will be found a complete exposition of this question.*

Nothing is more easy than to distinguish the urine rendered turbid by the presence of fatty matter, from that which has the same appearance, owing either to pus, phosphates, or urates. Purulent urine, when left to itself, becomes transparent after a time, and deposits a white compact substance, with a well marked level, which does not mingle with the portion of urine immediately in contact with it. By microscopical examination we are enabled to recognise the presence of characteristic globules of pus. The urine which contains fatty matter does not become transparent when left at rest, neither does it give any deposit, but on its surface is produced a stratum having a creamy aspect ; when treated by ether it is rendered completely clear, which is not the case with purulent urine.

Phosphatic urine deposits by rest a whitish matter,

* *L'Expérience*, Tome I., Nos. 37, 38, and 42, for the 5th, 10th, and 30th May, 1838.

but less compact than that produced by purulent urine. This precipitate is immediately dissolved, and the urine rendered perfectly transparent, by the addition of a small quantity of nitric acid. Moreover, by the aid of the microscope we recognise the crystalline characters of the phosphate of lime, and of the phosphate of ammonia and magnesia.

Urine loaded with urates is rendered clear by ebullition, and becomes again turbid on cooling. Nitric acid produces a precipitate of uric acid, easily recognised by the microscope.

If we are allowed to form an opinion from so limited a number of cases as we possess of the disease in question, we should consider it much less severe than Diabetes Mellitus.

We can only point out the treatment of Diabetes with Fatty Matter in a very incomplete manner, as cases at present are wanting. However, analogy ought to lead us to try the remedies which appear to have had the most success in Diabetes Mellitus. Animal diet, narcotics, baths, and strict attention to hygiene, are the first means to employ. If they fail, the physician ought to endeavour to find out the indications capable of guiding him in the especial case submitted to his observation.

DIABETES WITH EXCESS OF UREA.

(Diuresis Ureosa Azoturia.)

Dr. Prout was the first to mention this form of Diabetes, which he had several occasions to observe. He gave the best description of this disease which we still possess. Bostock had already proved the excess of urea in a case of Diabetes Insipidus. The quantity of this substance excreted by the patient in one day, amounted to seven ounces and a half, which is more than seven times the quantity evacuated by a healthy man ; four or five hundred grains, according to Mr. Mac Gregor, being the mean which a person in perfect health, excretes in twenty-four hours. Most of the assertions made by Dr. Prout, have been verified by Drs. Venables and Willis, who have since given their attention to this subject.

The *symptoms* accompanying this state of the urine, have a great analogy with those which belong to Diabetes Mellitus, except that they are less severe.

There is a peculiar and very remarkable symptom of this affection, which is the great irritability of the bladder, producing urgent and very frequent desire to make water, which is not generally proportionate to the quantity of urine evacuated. It exists during the night as well as during the day, and greatly torments the patient. There is at the same time, obtuse pain in the region of the kidneys, a sense of

smarting and burning in the course of the urethra while passing the urine.

The quantity of urine evacuated in twenty-four hours, varies considerably ; sometimes it is normal, or even less than in the natural state ; more frequently, it exceeds the usual quantity, and this diuresis has been known to be very considerable ; but those excessive urinary evacuations, so often met with in Diabetes Mellitus, have never been observed. Dr. Prout has made use of the variable state of the diuresis, in order to establish two forms or modifications of the disease, which he designates by the names of *Excess of Urea without Diuresis*, and, *Excess of Urea with Diuresis*, modifications which can only be considered as different degrees of the same malady.

The general falling away, the dryness of the skin, the functional disturbances of the nervous centres, are rarely carried to the same extent as in Diabetes Mellitus. The tongue generally remains moist and clean, the hunger is sometimes very voracious ; generally, however, this character is not very marked ; the thirst is moderate, except where the diuresis is considerable. Muscular weakness and inaptitude for any active occupation, are of frequent occurrence.

The causes of this affection are still very little known ; it has been generally observed to develop itself in the midst of circumstances, which appear to

favour the production of Diabetes Mellitus, especially those which act by weakening the constitution, such as sadness of mind, insufficient nourishment and of bad quality, the abuse of spirituous liquors, excess in venery, &c. Dr. Prout has remarked, that persons above the middle age, of a nervous constitution, thin and spare, are more particularly attacked with this disease. He has never observed it in women, but Dr. Venables has met with several such cases. The urine in this disease, possesses characters which it is necessary to study. Its specific gravity in general exceeds 1.020, but is seldom greater than 1.030. It is generally of a light brown colour, similar to that of ale; sometimes it becomes darker, and according to Dr. Prout, resembles porter mixed with more or less water; while at others, when the patient has drank a large quantity of liquid, it becomes pale and transparent. It is not uncommon to observe these changes take place in the same patient, generally speaking, in this species of Diabetes, as well as in health; the colour of the urine is less dark in proportion as the quantity is more considerable. Its taste is exceedingly salt and bitter, and it has a strong urinous, sometimes rather resinous odour. It reddens very strongly litmus paper. Nitric acid produces in it, after a short time, an abundant precipitate of nitrate of urea, which is recognised with the microscope by its being crystallized on plates, in the

shape of fern leaves, or in lancellated masses. The addition of yeast produces in it no alcoholic fermentation ; it becomes rapidly putrefied.

The *Diagnosis* of the affection under consideration, is generally sufficiently easy. It cannot be established solely on the existence of an excess of urea in the urine, the rapid and abundant crystallization of the nitrate of urea, being but a single element of the question ; for in other febrile affections, as in rheumatism for instance, the urine presents this peculiarity. The symptoms are of the utmost importance, especially the frequent desires to make water, which are totally disproportionate to the quantity of urine evacuated at each emission. The consideration of these two orders of phenomena, will almost always enable us to determine the disease we may have to treat.

The *Prognosis* is less severe than that of Diabetes Mellitus. It would appear from several observations, that Ureous Diabetes is the forerunner of Diabetes Mellitus ; in this case, the prognosis would be unfavourable, but Dr. Prout considers Ureous Diuresis to be a curable disease, or at least one which may be always rendered bearable by care and attention. Dr. Venables does not appear to consider the cure so easy, and he recommends us to be very careful in our prognosis. Judging from the few cases which I have been able to collect, this great precaution would be perfectly justifiable, and we ought rather to hope

to alleviate than cure the disease, by the therapeutical agents we have at our disposition.

Treatment.—The means of preventing the production of urea in the urine, are entirely unknown to us, consequently we have a great deal to discover with respect to the treatment of Diabetes with Excess of Urea. Most of the authors who have mentioned it, have adopted in this form of Diabetes, the treatment which appeared the less inefficacious in Diabetes Mellitus, and we have nothing further to add to what they have said on the subject.

A purely animal diet, administered in the manner above mentioned, has the twofold advantage of preventing the formation of saccharine matter on the one hand, and on the other, of diminishing the quantity of urine. To this may advantageously be added, some preparation of opium, which will act in the same manner, and also diminish the frequent desires to make water. Dr. Venables asserts having obtained great benefit from the employment of tonics and astringents, especially in combination with opium. Pills of extract of opium and gum kino, have appeared to him rapidly to diminish the diuresis. It is necessary to prevent the patients from taking liquids in large quantity, especially those of an exciting nature, such as tea, coffee, spirituous liquors, strong, and more particularly white wines. The cutaneous transpiration should be kept up by means of warm baths, frequently repeated, by warm cloth-

ing, and by exercise in the open air, continued so long as the patient's strength is sufficient to bear it. Constipation should be remedied by mild laxatives. Hygeinic means have perhaps a greater share in the treatment of the disease in question, than therapeutical remedies. We cannot too strongly recommend the greatest attention to be given to this subject.

AQUEOUS DIABETES.

(*Diuresis Aquosa, Diuresis Simplex, Anazoturia.*)

This is the form of Diabetes termed Insipidus, which is probably the most frequent, and which the ancients had more opportunities of observing. But as it is easily confounded with the preceding species of Diabetes, and with another disease with which it has a still greater resemblance, no importance can be attached to the observations which have anciently been published. It is only in modern works that we can obtain any information on this disease.

The symptoms common to Diabetes are also to be met with here: excessive thirst, voracious appetite, bodily and intellectual debility, emaciation, pains in the epigastrium and limbs, suppressed perspiration, a dry, rough skin, tongue thickly coated with mucus, frequent desires to void urine, the quantity of which is at times excessively abundant (20 or 30 pints). But these symptoms are generally less severe than in Diabetes Mellitus.

The urine is very pale and watery. Its specific gravity is but slightly higher than that of distilled water, from 1.000, to 1.010. By chemical analysis we can only discover a few traces of urea and its constituent salts, none of which have completely disappeared. It is a normal urine in which the water greatly predominates over the other elements.

The *diagnosis* of this form of Diabetes is generally easy. The slight density of the urine, and the impossibility of causing it to ferment by the addition of yeast, very clearly distinguish it from Diabetes Mellitus. Its transparency prevents it from being confounded with Diabetes, with fatty matter. The characters by which it may be distinguished from Diabetes Ureosus, are its light colour, and the non-crystallization of nitrate of urea, by the addition of nitric acid. But it is much more difficult to distinguish Aqueous Diabetes from Polydipsia, as the urine in both diseases presents exactly the same characters; in each there is excessive thirst, and greater hunger than natural. These common characters have caused the most modern authors to confound them. It is by observing the influence of the disease on the constitution, that we are able to form a truly differential character. Polydipsia is an affection which may last for years without injuring the constitution, consequently it may be considered more an infirmity than a disease. Provided the patient can satisfy his urgent thirst, he enjoys tol-

rably good health.* Aqueous Diabetes, on the contrary, soon produces a sensible and progressive emaciation, and occasions great disturbance in the sensorial and nutritive functions. I think, in order to well establish the difference between the two diseases, I cannot do better than give an extract from Dr. Davidson's Clinical Lecture on Aqueous Diabetes, published in the London Medical Gazette, October 16th, 1841, p. 136. These cases are so little known, that I think it may be useful to give an authentic example of it in this place.

DIABETES INSIPIDUS. Henry Levi, admitted, 18th of January, 1840, æt. 24 : Polish Jew, hawker, of full and flabby habit of body. Complains of soreness and weakness in back and lower extremities, great thirst, and general debility. Appetite voracious, and he has frequent calls to void urine, as often as every half hour ; perspires none, and is losing flesh rapidly. Urine, to-day, amounts to 20 pounds, specific gravity 1.006, of a pale straw colour, has very little taste, and a slight odour. First observed complaint about seven months ago, after exposure to cold and wet, while fatigued. Five months ago, he states that his urine was diminished to nearly its natural quantity by the use of opium. In this case the disease is characterised by many of the usual attendant symptoms, viz., weakness in back, loins,

* L. M. Lacombe, de la Polydipsie, Paris, Thesis, 1841.

and extremities, particularly his knees, which are often very painful; excessive thirst, voracious appetite, frontal head-ache, constipation, diminution of the physical weight; he also complains of confusion of head, and loss of memory. He is still of rather a full habit of body, and his skin is soft and smooth. His urine was of specific gravity 1.006, on his admission, and it still ranges about the same, being more generally 1.007, while it was once or twice as low as 1.004. Its quantity is generally from 18 to 20 pounds, but a few days after his admission it amounted to 28½ pounds; it is almost as colourless and transparent as water, has a slightly saline taste and urinous odour, deposits a very slight flocculent precipitate on standing for several days, and gives out an ammoniacal odour. No deposit is produced by heating it, or by the addition of nitric acid; it does not affect litmus or turmeric paper. Iodic acid and gelatinous starch when added to it, cause, in a short time, a purplish colour, which gradually deepens into a purplish blue tint: but by no means so deep as that produced in the healthy urine by re-agents. 1000 grains of his urine were evaporated to dryness, and the extract amounted to 8.2 grains; of this 5.0 grains were dissolved in three successive portions of alcohol. He was passing daily about 20 pounds of urine at this period; now, upon this calculation, the amount of solid matter passed in twenty four hours would be 944 grains, while, according to

Dr. Thomson's analysis, if the solid constituents of the urine be about 42 in 1000 grains, and the average diurnal quantity be 3 pounds, (36 ounces,) there ought to be only 725 grains of solid extract.

Treatment.—As there are some reasons for believing that, in this disease, as well as in Diabetes Mellitus, the digestive organs are in a state of derangement, a primary part of our treatment was attention to the stomach and bowels. His diet was, therefore, regulated, and it consisted of soup without vegetables, a moderate allowance of animal food, farinaceous substances, and milk. The quantity of food was also restricted to about twenty-two ounces of solids, in order that the digestive organs might not be burdened with more labour than they were capable of performing, while, at the same time, a sufficient supply of nutriment was furnished to the system ; and as his residence in the hospital exposed him to no corporeal tear and wear, this amount of food was calculated to be about enough. He also attempted to limit the quantity of his drink to six pounds, but on several occasions found the discrepancy between his ingesta and egesta so enormous, that there seemed no possibility of explaining it on any other principle than that he had stolen an additional supply of water. This restriction was, therefore, abandoned as impracticable.

When first admitted, he had several purgatives of castor oil and calomel, and his drink was acidulated

with aromatic sulphuric acid, and, in order to determine to the skin, he was ordered the warm bath every second night. As he complained much of frontal headache and loss of memory, his head was shaved, and afterwards a blister was applied to the nape of the neck. He was ordered, on the 31st of January, the following combination of gentian and opium.

℞. Infus. Gentian lbss ; Tinct. Opii 3 gr. M.
Cap. 3 iss.; Misturæ sexta quaque hora.

As the urine was still about 18 pounds, and as very little impression had been made on the disease, the quantity of laudanum in the mixture was increased to an ounce, and a blister applied to the nape of the neck on the 6th of February. From this time the urine began to diminish in quantity; his headache was less, his strength was greater, his thirst diminished, and his tongue was pretty clean; but his bowels required the regular use of the colocyath pill. He was discharged on the 15th of March, nearly cured, his urine being about 90 ounces of specific gravity 1.011, having a very urinous odour; but it is not all improbable that the disease will return if he be again exposed to the irregularities of his avocation.

Dr. Graves has published, in the sixth volume of the Dublin Journal of the Medical Sciences, p. 74, a case of Aqueous Diabetes, in which the symptoms were still more severe.

The *Prognosis* is less unfavourable than in the other form of Diabetes. However, we must not entirely adopt the opinion of even the most modern authors, who consider Aqueous Diabetes as an affection which produces no bad effect on the constitution. It is easily seen that they have all confounded it with Polydipsia, and it is from cases of this latter disease, that they have formed their opinion. Even Drs. Prout and Christison have fallen into the same error. The case of Dr. Graves, mentioned above, proves that the disease in question may occasion the most severe accidents, which would quickly terminate in the death of the patient, unless medical aid was had recourse to. But at the same time, it proves that it is much more easy to contend against these accidents, than when they are produced by the other forms of Diabetes; and that although we may not succeed in curing the disease, we may at least arrest its progress, and bring the sufferer to a tolerably good state of health.

The *causes* which appear to favour the development of Aqueous Diabetes, are the same as those we have already mentioned in the other forms of Diabetes; bad food, cold, dampness, sadness. Drs. Venables and Willis assert having frequently observed this disease in children; but several of their observations appear to me to relate to other diseases, more particularly to Tabes Mesenterica. Nevertheless, I recollect a case of it in a child of four years; mastur-

bation was its exciting cause. The child was attended to, and the medical treatment had the desired effect.

The *treatment* of Aqueous Diabetes ought to be founded upon the same principles as that of the other forms of Diabetes. Opium has also in these cases the property of calming the most urgent symptoms, especially diuresis. It may be very advantageously combined with bitters and tonics; animal diet, but less strict than for the other forms, is also attended with favourable results; and we should never deprive ourselves of this resource. Dr. Venables says he has obtained the greatest benefit from the preparations of iron, especially the proto-carbonate, the phosphate and sesqui-chloride. He combines one of these salts with opium or morphia and ipecacuanha; as an astringent he prefers uva ursi. Dr. Graves has treated this affection with Dover's powder, in doses of from 40 to 60, and even 150 grains per day, and together with this, warm or vapour baths frequently repeated, in order to re-establish and entertain cutaneous perspiration. Hygeinic precautions will not be of less service here than in the other species of Diabetes. It is especially by their assistance that we should endeavour to prevent a recurrence of the disease, a circumstance which ought always to be dreaded.

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It is not my intention to give in this place, a list of all the works that have been published on Diabetes. There are few diseases upon which more has been written, and to collect the titles of all the publications, would be a labour not less fastidious than useless. I shall merely mention in the following bibliography, those works which have appeared to me useful to consult, and capable of throwing light on some parts of the history of Diabetes. As for the immense number of memoirs, observations, and theses, which only encumber the science without enriching it, I have considered it better to omit them. I have also thought it useless to mention the works anterior to the period when chemical research became one of the principal elements in the Diagnosis of Diabetes. Having in my essay carefully omitted them, it would have been superfluous to mention them in this place. In Trnka's work will be found a sufficiently detailed account of all the works published previous to him.

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ERRATA.

- Page 1, for '*diabesev*' read *diabesew*.
 — 6, note, for '*Egritead*' read *Egritud*.
 — 33, line 4, for '*system*' read *symptom*.
 — 40, line 6, for '*pneumonia*' read *pneumonia*.
 — 49, line 8 from the bottom, for '*diastace*' read *diastase*.
 — 59, line 5, for '*urei*' read *uræ*.

